California Environmental Protection Agency
Airi Resources Board

PUBLIC MEETING AGENDA

June 25 & 26,2009

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This facility is accessible by public transit. For transit information, call (916) 321-BUSS, website: http://www.sacrt.com
(This facility is accessible to persons with disabilities.)

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO: http://www.arb.ca.gov/lispub/comm/bclist.php

June 25,2009
9:008,m,

Agenda Item #

09-6-1: Health Update: The Urban Environment and Health

Staff will present an overview of the literature on the characteristics of the urban environment that may influence health. The urban environment, which is also known as the built environment, influences global warming and climate change as addressed in Senate Bill 375. It is also emerging as an important factor for health promotion and obesity prevention. The studies presented will focus on results from the Portland Neighborhood Environment and Health Study and show that highly walkable neighborhoods are associated with reduced obesity and other health conditions linked with excess weight compared to other neighborhoods.

09-6-2: Public Meeting to Update the Board on the Climate Change Scoplng Plan Implementation

Staff will update the Board on the status of implementing the Climate Change Scoping Plan.

09-6.3: Public Hearing to Consider Adoption of a Proposed RegUlation to Reduce Methane Emissions from Municipal Solid Waste Landfills

Staff will propose a regulation which would require the installation of gas collection and control systems at smaller and other uncontrolled municipal solid waste landfills. The proposed regUlation includes requirements for all affected landfills to ensure that gas collection and control systems are operating optimally and that fugitive emissions are minimized.

09-6-4: Public Hearing to Consider Adoption of Cool Car Standards and Test Procedures for 2012 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles

Staff will propose a regulation that would reqUire glass on new vehicles less than or equal to 10,000 pounds to meet solar management standards. Solar glass will reduce a vehicle's interior temperature when it is parked in the sun, making the driver less likely to activate the air conditioner and allowing manufacturers to downsize a vehicle's air conditioning unit. Reducing mobile air conditioning usage or downsizing of a vehicle's air conditioning unit will result in lower greenhouse gas emissions, as well as reduced fuel use.

09-6-5: Public Hearing to Consider Adoption of a Proposed AB 32 Cost of Implementation Fee Regulation and Proposed Amendment to the Existing Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

Staff will propose a new regulation to assess fees on sources of greenhouse gas emissions. The revenue from these fees will be used to pay for the administrative costs of implementing the California Global Warming Act of 2006 (AB 32), as specified in Health and Safety Code section 38597. Staff will also propose an amendment to ARB's Mandatory Reporting Regulation to require electronic reporting of the required data.

09-6-6: Public Meeting to Provide the Board Information on the New Drive Clean Website

Staff will give the Board a preview of the new Drive Clean website. This website is a buying guide for clean and efficient vehicles and features smog and global warming scores for cars certified in California.

June 26, 2009
8:30 a.m.

Agenda Item #

09-6-7: Public Hearing to Adopt Proposed AB 118 Enhanced Fleet Modernization Program Regulation (Car Scrap)

Staff will propose a new regulation to expand the State's voluntary accelerated vehicle retirement program to target the highest polluting vehicles in the areas with the greatest air quality problems. The proposal includes additional compensation for vehicle replacement and low-income populations.

09-6-10: Public Meeting to Update the Board on Outreach and Funding Assistance for Truck Owners

Staff will describe plans for ARB and local air district outreach to truck owners on rule requirements and incentive funding. This informational update will cover development of a comprehensive portal or front door for truck owners to access information on all ARB rules affecting trucks and on-board equipment, as well as available incentives.

09-6-11: Public Meeting to Update the Board on ARB Efforts to Develop Recommendations for Further Locomotive and Railyard Emission and Risk Reductions.

Staff will provide the Board with a brief informational update on efforts to develop recommendations that can provide further locomotive and railyard emissions and risks reductions beyond those expected from existing U.S. EPA and ARB regulations and agreements.

CLOSED SESSION - LITIGATION

The Board will hold a closed session, as authorized by Government Code section 11126(e), to confer with, and receive advice from, its legal counsel regarding the following pending litigation:

Central Valley Chrysler-Jeep, Inc. et al. v. Goldstene, U.S. Court of Appeals, Ninth Circuit, No. 08-17378 on appeal from U.S. District Court (E.D. Cal. - Fresno).

Fresno Dodge, Inc. et al. v. California Air Resources Board et al., Superior Court of California (Fresno County), Case No. 04CE CG03498.

General Motors Corp. et al. v. California Air Resources Board et al., Superior Court of California (Fresno County), Case No. 05CE CG02787.

State of California by and through Arnold Schwarzenegger, the California Air Resources Board, and the Attorney General v. U.S. Environmental Protection Agency, and Stephen L. Johnson, Administrator, U.S. Court of Appeals, District of Columbia Circuit, Case No. 08-1178.

California Business Properties Association, et al. v. California Air Resources Board, Superior Court of California (Sacramento), Case No. 34-2009-80000232.

Green Mountain Chrysler-Plymouth-Dodge-Jeep, et al. v. Crombie, 508 F.Supp.2d 295, U.S. District Court Vermont (2007), appeal to U.S. Court of Appeals, Second Circuit, Nos. 07-4342-cv(L) and 07-436D-cv(CON).

Pacific Merchant Shipping Association v. Goldstene, U.S. District Court, EDCA, Case No. 2:09-C - 01151-MCE-EFB.

American Trucking Association, et al. v. U.S. Environmental Protection Agency, et al., U.S. Court of Appeals, District of Columbia Circuit, Case No. 09-1090.

OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST

Board members may identify matters they would like to have noticed for consideration at future meetings an comment on topics of interest; no formal action on these topics will be taken without further notice.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING. BOARD ITEMS NOTED ABOVE WHICH ARE NOT COMPLETED ON JUNE 25, WILL BE HEARD ON JUNE 26 BEGINNING AT 8:30 A.M.

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:
http://www.arb.ca.gov/lispub/comm/bclist.php

IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE CLERK OF THE BOARD:
OFFICE: (916) 322-5594
1001 I Street, Floor 23, Sacramento, California 95814
ARB Homepage: www.arb.ca.gov

To request special accommodation or language needs, please contact the following:

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by Fax at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. TTYITDD/Speech to Speech users may dial 711 for the California Relay Service.

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

California Environmental Protection Agency
Air Resources Board

PUBLIC MEETING AGENDA

LOCATION:
Air Resources Board
Byron Sher Auditorium, Second Floor
1001 I Street
Sacramento, California 95814

This facility is accessible by public transit. For transit information, call (916) 321-BUSS, website: http://www.sacrt.com
(This facility is accessible to persons with disabilities.)

INDEX

June 25, 2009 at 9:00 a.m.
&
June 26, 2009 at 8:30 a.m.

Handout for *Climate Change Scoping Plan Implementation Update:*
Scoping Plan Measures Implementation Timeline

Air Resources Board staff developed the following Scoping Plan Measures Implementation Timeline to provide up-to-date and easily accessible information on the measures proposed in the AB 32 Climate Change Scoping Plan. Many of these measures will be developed in 2009 and 2010 and go into effect by the start of 2011. This timeline outlines the following information for each measure: the lead agency, type of action being taken (e.g., regulatory, voluntary), planned adoption and implementation dates, quantity of greenhouse gas reductions expected by 2020, and (in the online version of the document) hyperlinks to the pertinent section of Scoping Plan, measure websites (as available), and staff contacts.

This handout is updated as new information becomes available; the updated version is available online at http://www.arb.ca.gov/cc/scopingplan/sp measures implementation timeline.pdf.

. I

Scoping Plan Measures Implementation Timeline*
June 5,2009

Row #	Scoping Plan Measure	Measure #	Page #	Responsible Agency (ies) (Lead in Bold)	Planned Adoption Date†	Implementation Date	MMT CO_2E Reductions in 2020 ‡	Type of Action (Regulation, Voluntary, etc.)	Staff Contact
	Pavley (AB 1493)	T-1	C-57	ARB	Sep-2004 (Approved)	2009-2016	27.7	Regulation	Paul Hughes
2	Ship Electrification at Ports (Discrete Early Action)	T-5	C-66	ARB	Dec-2007 (Approved)	2010	0.2	Regulation	Grant Chin
3	Port Drayage Trucks	T-6	C-68	ARB	Dec-2007 (ApprOVed)	Beginning 2010	3.5§	Regulation	Mike Miguel
4	Limit High GWP Use in Consumer Products (Discrete Early Action): Pressurized Gas Duster GWP Limit of 150	H-4	C-179	ARB	Jun-2008 (Approved)	2010	0.23	Regulation	David Mallorv
5	HeaW-Duty Vehicle GHG Emission Reduction (Aerodynamic Efficiency) (Discrete Early Action)	T-7	C-73	ARB	Dec-2008 (Adopted)	Phased-In Schedule for large fleets: Beginning 2010; Final compliance 2013	0.93	Regulation	David Chen
6	Motor Vehicle Air Conditioning Systems: Reduction of Refrigerant Emissions from Non-Professional Servicing (Discrete Early Action)	H-1	C-175	ARB	Jan-2009 (Adopted)	2010	0.26	RegUlation	Tao Huai
7	SF_6 Limits in Non-Utilitv and Non-Semiconductor Applications (Discrete Early Action)	H-2	C-176	ARB	Feb-2009 (Ado'pted)	2010	0.10	Regulation	Elizabeth Scheehle
8	Reduction of Perfluorocarbons in Semiconductor ManUfacturing (Discrete Early Action)	H-3	C-177	ARB, Local Air Districts	Feb-2009 (Adopted)	2012	0.18	Regulation	Dale Trenschel
9	Tire Pressure Program (Discrete Early Action)	T-4	C-63	ARB	Mar-2009 (Adopted)	2010	0.55	RegUlation	Mike Miguel
10	Low Carbon Fuel Standard (Discrete Early Action)	T-2	C-64	ARB.	Apr-2009 (Adopted)	2010	16	Regulation	John Courtis
11	Landfill Methane Control Measure (Discrete Early Action)	RW-1	C-160	ARB	June-2009	2010		Regulation	Richard Boyd
12	Cool Car Standards and Test Procedures	T-4	C-63	ARB	June-2009	2012	0.89	Regulation	Mariike Bekken
13	Stationarv Eguipment Refrigerant Management program- Refrigerant Tracking/Reporting/ RepairlDeposit Program	H-6	C-183	ARB	Sept-2009	2010	11	Regulation	Pamela Gupta

Scoping Plan Measures Implementation Timeline*
June 5,2009

Row #	Scoping Plan Measure	Measure #	Page #	Responsible Agency (ies) (Lead in Bold)	Planned Adoption Date†	Implementation Date	MMT CO_2E Reductions in 2020 ‡	Type of Action (Regulation, Voluntary, etc.)	Staff Contact
14	Energy Efficiency and Co-Benefits Audits for Large Industrial Sources	1-1	C-150	ARB	Oct-2009	2010	N/A	Regulation	Lisa Williams
15	Sulfur Hexafluoride (SF_6) Emission Reductions from the Electricity Sector and Particle Accelerators	H-6	C-186	ARB	Dec-2009	2011	0.1	Regulation	Michelle Garcia
16	Mitigation Fee on High GWP Gases	H-7	C-189	ARB	May-2010	2010	5	Regulation	Elizabeth Scheehle
17	Tire Tread Program	T-4	C-63	CEC	2009	2010	0.3	Regulation	Ray Tuvell
18	Oil and Gas Extraction GHG Emission Reduction	1-2	C-153	ARB, Local Air Districts	Mar-2010	2015	0.2	Regulation	Joe Fischer
19	Transport Refrigeration Units Cold Storage Prohibition and Energy Efficiency	T-6	*C-B9*	ARB	2010	TBD	3.5§	Regulation (cold storage) and Guidelines (energy efficien	Rod Hill
20	Foam Recovery and Destruction Program	H-6	C-185	ARB	Dec-2010	2011	0.3	Regulation	Glenn Gallagher
21	Cap-and-Trade		C-11	ARB	Nov-2010	2012	34.4	Regulation	Lucille Van Ommering
22	Pavley II	T-1	C-56	ARB	2010	2017	4.1	Regulation	Paul Hughes
23	High GWP Reductions from Mobile Sources Low GWP Refrigerants for New Motor Vehicle Air Conditioning Systems	H-5	C-179	ARB	2010	2015	2.5	Regulation	Tao Huai
24	Refinery Flare Recovery System Improvement	1-4	C-155	ARB, Local Air Districts	Dec-2010	2012	0.33	Regulation	Mike Waugh
25	Removal of Methane Exemption from Existing Refinery Regulations	1-5	C-156	ARB, Local Air Districts	Dec-201p	2012	0.01	Regulation	Reza Lorestany
26	GHG Leak Reduction from Oil and Gas Transmission and Distribution	1-3	C-154	ARB, Local Air Districts	Dec-2010	2015	0.9	Regulation	Win Setiawan
27	Altemative Suppressants in Fire Protection Systems	H-6	C-187	ARB, Cal Fire	Dec-2011	2012	0.1	Regulation	Elizabeth Scheehle

Seoping Plan Measures Implementation Timeline*
June 5, 2009

Row #	Scoping Plan Measure	Measure #	Page #	Responsible Agency (ies) (Lead in Bold)	Planned Adoption Date†	Implementation Date	MMT CO_2E Reductions in 2020 ‡	Type of Action (Regulation, Voluntary, etc.)	Staff Contact
28	Stationary Eguipment Refrigerant Management Program- Specifications for Commercial and Industrial Refrigeration	H-6	C-182	ARB and CEC	2011 (CEC)	2012	4	Regulation	Pamela Gupta
29	Low Friction Engine Oil	T-4	C-63	ARB	TBD	TBD	2.8	Regulation	Sharon Lemieux
30	Medium- and Heavy-Duty Vehicle Hybridization	T-8	C-73	ARB	TBD	TBD	0.5	Regulation	Stephan Lemieux
31	Reuse Urban Runoff	W-4	C-134	.SWRCB	TBD	2020	0.2'"	Regulation	Robert DuVall
32	Public Goods Charge for Water	W-6	C-136	DWR,ARB, CPUC, SWRCB	TBD	2012	TBD	Regulation	Robert DuVall
33	Water Recycling	W-2	C-133	SWRCB,DWR	TBD	2030	0.3'"	Regulation	Robert DuVall
34	Feebates (in lieu of Pavley regs)	T-1	. C-61	ARB	TBD	TBD	31.7	Regulation (if needed)	Matt Zaragoza
35	Refrigerant Recovery from Decommissioned Refrigerated Shipping Containers	H-5	C-181	ARB	2010	2012	0.2	RegulatiOn! Program	Tao Huai
36	Solar Water Heating: AB 1470	CR-2	C-118	CPUC	2010	2020	0.1	Incentive	Nicolas Chaset
37	Million Solar Roofs: 3.000 MWby2017	E-4	C-120	CPUC,CEC, .ARB	Current Program	Through 2016	2.1	Incentive	Nicolas Chaset
38	Residential Refrigeration Early Retirement Program	H-6 .	C-188	ARB	Dec-2010	2011	0.1	Incentive Partnership *wl* Utilities	Charles Seidler
39	Commercial Recvcling	RW-3	C-161	CIWMB	2010	2020	5'"	Mandate	Johnnie Raymond
40	High Speed Rail	T-9	C-85	HSRA	NA	2020		NA	Kris Deutsch-man
41	Green BUildings	GB-1	C-142	DGS, ARB, CEC, CPUC, HCD	Ongoing	TBD	26'"	NA	Dana Papke Waters
42	Enforcement of Federal Ban on Refrigerant Release during Seryicing or Dismantling of Motor Vehicle Air Conditioning Systems	H-5	C-182	ARB	2009	2010	0.1	Partnership	Tao Huai

Scoping Plan Measures Implementation Timeline*
June 5, 2009

Row #	Scoping Plan Measure	Measure #	Page #	Responsible Agency (ies) (Lead in Bold)	Planned Adoption Date†	Implementation Date	MMT CO_2E Reductions In 2020‡	Type of Action (Regulation, Voluntary, etc.)	Staff Contact
43	Air Conditioner Refrigerant Leak Test During Vehicle Smog Check	H-5	C-180	ARB, BAR	2010	2012	0.5	Partnership	Tao Huai
44	Water-Use Efficiency	W-1	C-132	DWR, SWRCB,CEC, CPUC,ARB	Spring 2009	2020	1.4**	Various	Robert DuVall
45	Renewables Portfolio Standards (33% by 2020 for 10Us& POUs)	E-3	C-126	**CPUC, CEC,** ARB.	2009	2020	21.3	Various	Paul Doyglas
46	Increasing Combined Heat and Power Use by 30,000 GWh	E-2	C-122	CPUC,CEC, ARB	2009	2020	'6.7	Various	Gary Collord
47	Regional Transportation-Related Greenhouse Gas Targets	T-3	C-74	ARB, Local Governments, Regional Planning Agencies	Sep-2010	Set targets by 2010. Local actions have begun already in some areas	5	Various	Doug Ito
48	Energy Efficiency Measures (Electricity)	E-1	C-99	**CEC,** CPUC, ARB	Ongoing	Through 2020	15.2	Various	Bill Knox
49	Energy Efficiency (Natural Gas)	CR-1	C-99	CPUC,CEC, ARB	Ongoing	Through 2020	4.3	Various	Bill Knox
50	Local Govemment Assistance	NA	C-49	ARB, CalTrans, CEC, CTC, HCD,OPR	Ongoing	NA	NA	Various	Webster Tasat
51	Sustainable Forest Target	F-1	C-166	Board of Forestry and Fire Protection	TBD	Through 2020	5	Various	Shelby Livingston
52	State Government	NA	C-25	**Cal/EPA,** ARB, DGS	TBD	Ongoing	1-2**	Various	John Blue
53	N_2O collaborative research	NA	C-195	ARB,CEC, CDFA	Feb-2009	Sept. 2012	NA	Voluntary	Shelby Livingston
54	Local Govemment Toolkit	NA	C-54	ARB	May-2009	Ongoing	NA	Voluntary	Dana Papke Waters
55	Small Business Toolkit	NA	86	ARB	Apr-2009 (update)	Ongoing	NA	Voluntary	Kyra Naumoff
56	Cargo Handling Eguipment-Anti-Idling, Hybrid Electrification	T-6	C-69	ARB	2010	2010-2011	3.5§	Voluntary	Cherie Rainforth

Scoping Plan Measures Implementation Timeline*
June 5,2009

Row #	Scoping Plan Measure	Measure #	Page #	Responsible Agency (ies) (Lead in Bold)	Planned Adoption Date[1]	Implementation Date	MMT CO_2E Reductions in 2020 ±	Type of Action (Regulation, Voluntary, etc.)	Staff Contact
57	Goods Movement System-Wide Efficiency Improvements	T-6	C-67	ARB	2009-2012	2012-2015	3.5§	Voluntary	Peggy Taricco
58	Methane Capture at Large Dairies	A-1	C-194	ARB	2014	2017-2920	1**	Voluntary	Kitty Howard
59	Increase Production and Markets for Compost (studies underway for data development)	RW-3	C-161	CIWMB	2009	Ongoing	2**	Voluntary	Johnnie Raymond
60	Greening New and Existing State Buildings	GB-1	C-142	DGS	Ongoing	TBD	TBD	Voluntary	Dana Papke Waters
61	Greening' Public Schools	GB-1	C-143	DGS	Ongoing	TBD	TBD	Voluntary	Dana Papke Waters
62	Forest Conservation, Forest Management Afforestation/Reforestation, Urban Forestrv and Fuels Management	NA	C-167	Cal Fire	Ongoing	2020	Potentially 2**	Voluntary	Shelby Livingston
63	Extended Producer Responsibilitv (EPR)	RW-3	C-162	CIWMB	Pending Legislation	2020	TBD**	Voluntary	Johnnie Raymond
64	Commercial Harbor Craft-Maintenance and Design Efficiency	T-6	C-69	ARB	2009-2010	2010-2011	3.5§	Voluntary	Kirk .Rosen-kranz
.65	Increasing the Efficiency of Landfill Methane Capture	RW-2	C-160	CIWMB	June-2009'	2020	TBD**	Voluntary	Scott Walker
66	Anaerobic Digestion	RW-3	C-162	CIWMB	TBD	2020	2**	Voluntary	Clark Williams
67	Environmentally Preferable PUrchasing (EPP)	RW-3	C-162	CIWMB,DGS	TBD	TBD	TBD**	Voluntary	Kathy Frevert
68	Water System Energy Efficiency	W-3	C-133	CEC,CPUC, DWR,SWRCB	TBD	2020	2**	Voluntary	Robert DuVall
69	Increase Renewable Energy. Production (from Water sector)	W-5	C-135	CEC. CPUC	TBD	2020	0.9**	Voluntary	Robert DuVall
70	Clean Ships	T-6	C-68	ARB	TBD	TBD	3.5§	Voluntary/ Regulation	Peggy Taricco

Scoping Plan Measures Implementation Timeline*
" June 5, 2009

Row #	Scoping Plan Measure	Measure #	Page #	Responsible Agency (ies) (Lead in Bold)	Planned Adoption Date†	Implementation Date	MMT CO_2E Reductions in 2020 ‡	Type of Action (Regulation, Voluntary, etc.)	Staff Contact
71	Vessel Speed Reduction	T-6	C-68 "	ARB	2009-2010	2010	3"5§	Voluntaryl Regulation	Michelle Komlenic
72	Greening New Residential and Commercial Construction	GB-1	C-145	CEC,CPUC, Building Standards Commission	Ongoing	TBD	TBD	Voluntaryl Incentive	Dana Papke vilaters
73	Greening Existing Homes and Commercial Buildings	GB-1	C-146	CEC,CPUC	Ongoing	TBD	TBD	Voluntaryllnc entive	Dana Papke Waters

* Measures in this timeline are sorted by "Type of Action."

t "Adopted" means that the measure was adopted by Air Resources Board (ARB). "Approved" means that the measure was approved by Office of Administrative Law.

‡ $MMTCO_2E$ means million metric tons of carbon dioxide equivalent. For measures adopted by ARB, reductions are current as of the adoption date. Otherwise, reductions are the same as estimated in the Seoping Plan.

"§ All of the T-6 measures together add up to 3.5 $MMTCO_2e$.

** Not counted toward the 2020 total of 174 $MMTCO_2e$

For general questions, please contact Robert DuVall at 9"16-324-5930.

TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF A PROPOSED REGULATION TO REDUCE METHANE EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS

The Air Resources Board (ARB or the Board) will conduct a public hearing at the time and place noted below to consider adopting a regulation to reduce emissions of methane, a greenhouse gas (GHG), from municipal solid waste (MSW) landfills.

DATE: June 25-26,2009

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 25,2009, and may continue at 8:30 a.m., June 26,2009. This item may not be considered until June 26,2009. Please consult the agenda for the meeting, which will be available at least 10 days before June 25, 2009, to determine the day on which this item will be considered.

If you require special accommodations or'language needs, please contact the Clerk of the Board at (916) 322-5594 or by fax at (916) 322-3928 as soon as possible, butno later than 10 business days before the scheduled Board hearing. *TTYfTDD/Speech* to Speech users may dial 711 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed adoption of California Code of Regulations, title 17, subchapter 10, article 4, subarticle 6. Methane Emissions from Municipal Solid Waste Landfills, sections 95460,95461,95462,95463,95464,95465,95466, 95467, 95468, 95469,95470,95471,95472,95473,95474,95475,and95476.

Background: In 2006, the Legislature passed, and Governor Schwarzenegger signed, the California Global Warming Solutions Act of 2006 (Assembly Bill 32; Stats. 2006, chapter 488). In Assembly Bill (AB) 32, the Legislature declared that global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The Legislature further declared that global warming will have detrimental effects on some of California's largest industries, including agriculture and tourism, and will increase the strain on electricity supplies. While national and

international actions are necessary to fully address the issue of global warming, the Legislature recognized that action taken by California to reduce GHG emissions will have far-reaching effects by encouraging other states, the federal government, and other countries to act. AB 32 creates a comprehensive, multi-year program to reduce GHG emissions in California, with the overall goal of restoring emissions to 1990 levels by the year 2020. AB 32 requires ARB to take actions that include:

- Establishing a statewide GHG emissions cap for 2020, based on 1990 emissions;

- Adopting a Scoping Plan by January 1, 2009, indicating how emission reductions will be achieved from significant GHG sources via regulations, market mechanisms, and other actions;

- Adopting a list of Discrete Early Action GHG emission reduction measures by June 30,2007, which can be implemented and enforced no later than January 1, 2010; and

- Adopting regulations by January 1, 2010, to implement the measures identified on the list of Discrete Early Action Measures.

In June 2007, the Board identified a measure to reduce methane emissions from MSW landfills as a discrete early action measure.

Methane is a major contributor to climate change, having a global warming potential of 21 times that of carbon dioxide. It has a relatively short atmospheric lifetime of about ten years. Changes in a methane source's emissions level can affect atmospheric concentrations in a relatively short time scale.

In California, MSW landfills are the second largest anthropogenic source of methane. The organic portion of solid waste disposed in MSW landfills decomposes to form landfill gas; methane typically accounts for about 50 percent of the total landfill gas composition. Approximately 1.2 billion tons of solid waste has accumulated in the State's landfills, with an additional 40 million tons being added each year. In 1990, GHG emissions from MSW landfills were estimated to be about 6.3 million metric tons of carbon dioxide equivalents (MMTC02E). These emissions are forecasted to increase to approximately?7 MMTC02E in 2020. Emissions from MSW landfills represent about one percent of the statewide GHG inventory. If not captured, combusted, or treated in control systems, landfill gas can either be released into the atmosphere as fugitive emissions or migrate underground to cause groundwater contamination.

In the 1990s, many local air districts adopted regulations to reduce emissions of volatile organic compounds, an ozone precursor, from landfills. These regulations resulted in landfill gas collection and control systems being installed at most large landfills. About 93 percent of the total statewide waste-in-place (the amount of waste in a landfill) is contained in landfills with gas collection and control systems.

Description of the Proposed Regulatory Action: The proposed regulation applies to active, inactive, and closed MSW landfills that received solid waste after January 1, 1977, and have at least 450,000 tons of waste-in-place. Currently uncontrolled landfills that meet these criteria will be required to install gas collection and control systems. All affected landfills will be required to maintain landfill gas collection and control systems to specified standards. Currently uncontrolled landfills that meet these criteria. Installation and proper operation of these systems will significantly reduce the emissions of methane and other volatile organic compounds produced as organic materials decompose in landfills. The proposed regulation contains performance standards for the gas collection and control system, and specifies monitoring requirements to ensure that that the system is being maintained and operated in a manner to minimize methane emissions.

ARB staff estimates that there are 14 uncontrolled landfills with at least 450,000 tons of waste-in-place that may generate sufficient gas to support the installation of a gas collection and control system. Based on ARB staff's 2020 forecast of landfill emissions, if all 14 of those landfills were to install emission controls for methane, there would be a reduction of about 0.4 MMTC0_2E in 2020. The implementation and enforcement of the monitoring and performance requirements of the proposed regulation for the remaining estimated 298 affected MSW landfills with gas collections systems already installed is expected to result in an additional estimated emission reduction of 1.1 MMTC0_2E.

Surface Emission Standards

The proposed regulation includes monitoring requirements to ensure that gas collection and control systems are operating optimally and that fugitive emissions are minimized. Staff is proposing an instantaneous surface monitoring standard of 500 parts per million by volume (ppmv) and an integrated surface sampling standard of 25 ppmv to ensure that the gas collection system is adequately controlling emissions. Instantaneous surface monitoring is used to monitor integrity of the landfill surface and to identify point sources where methane may be escaping into the atmosphere (e.g., around cover penetrations, areas of distressed vegetation, cracks, or seeps in the landfill cover system). Integrated surface sampling accumulates and averages the instantaneous surface monitoring readings and provi.des a more direct means of revealing clusters of emissions that would indicate possible gas collection system problems. Landfill owners and operators are given the opportunity to repair leaks or make the appropriate adjustments to their gas collection and control systems before an exceedance of the standard is considered a violation.

Compliance Dates

The proposed, regulation requires uncontrolled landfills with at least 450,000 tons of waste-in-place to submit a Design Plan prepared by a registered professional engineer. The Design Plan must provide for the control of the collected landfill gas through the use of a gas collection and control system and be designed to collect gas at a sufficient extraction rate to maintain negative pressure at all wellheads (except under specified

conditions). Within 18 months after approval of the Design Plan, active landfills must demonstrate installation of an active gas collection and control system. This compliance schedule should provide sufficient time for the operator to obtain the necessary local agency permits and for installation of the system. Closed and inactive landfills must also demonstrate installation of a gas collection and control system but have up to 30 months after approval of the Design Plan to comply. This compliance schedule provides an extra year for closed or inactive landfills to secure the necessary funds to comply.

Beginning January 1, 2011, owners and operators that are required to install a gas collection and control system, or are already operating a gas collection and control system, must monitor the surface of their landfills to ensure compliance with the surface methane emissions standards. This compliance schedule allows landfill owners or operators time to adjust their current practices to the surface standards and monitoring requirements.

Recordkeeping and Reporting

Under the proposed regulation, municipal solid waste landfill owners and operators will be subject to recordkeeping and reporting requirements. These requirements include maintaining records of the landfill's annual waste acceptance rate and current amount of waste-in-place, monitored operating parameters of the gas collection and control system, equipment downtime, and records of all component leak testing and surface emissions monitoring. These records, necessary to monitor methane emissions and track AB 32 performance objectives, must be submitted to ARB.

COMPARABLE FEDERAL REGULATIONS

Federal New Source Performance Standards and Emission Guidelines for Municipal·Solid Waste Landfills

MSW landfills are regulated under local air district rules that implement the requirements of the New Source Performance Standards (NSPS) and Emission Guidelines (EG) (40 CFR Part 60 Subparts WWW and Cc) for MSW landfills. The NSPS applies to "new" MSW landfills that commenced construction, modification, or reconstruction on or after May 30,1991. The EG applies to "existing" MSW landfills that commenced construction, modification, or reconstruction before May 30, 1991, and that have accepted waste at any time since November 8, 1987, or have additional capacity for future waste deposition. The NSPS and EG require the installation of a landfill gas collection and control system when a MSW landfill reaches a design capacity of 2.75 million tons or greater and has a non-methane organic compound emission rate of 55 tons per year, or greater.

ARB and the local air districts were required to develop and submit a "State Plan" to the United States Environmental Protection Agency (U.S. EPA) for implementing and enforcing the requirements of the EG. Local air districts that elected not to adopt rules

to implement the EG were placed under a Federal Plan, which is directly enforced by U.S. EPA. In general, the larger California air districts adopted rules whereas several smaller districts are subject to the Federal Plan. U.S. EPA promulgated the NSPS and EG on March 12, 1996.

National Emission Standards for Hazardous Air Pollutants· Municipal Solid Waste Landfills

U.S. EPA promulgated the National Emissions Standards for Hazardous Air Pollutants (NESHAP) for MSW landfills (40 CFR Part 63 Subpart AAAA) on January 16, 2003. The NESHAP has the same requirements as the NSPS, but also contains provisions for start-up, shut-down, and additional record keeping and reporting requirements. The proposed regulation differs from federal NSPS and NESHAP requirements in that it applies to smaller landfills (450,000 versus 2,750,000 tons of waste-in-place) and has more stringent requirements for methane collection and control, component leak testing and surface emissions monitoring, and compliance schedules; The more stringent requirements in the proposed regulation are needed to maximize GHG emission reductions. Since the requirements of the proposed regulation are more stringent, they do not conflict with or impede compliance with the existing federal requirements.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a staff report for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: Staff Report: Initial Statement of Reasons (ISOR) for the Proposed Regulation to Reduce Methane Emissions from Municipal Solid Waste Landfills, April 2009.

Copies of the ISOR and the full text of the proposed regulatory language may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing on June 25,2009.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on ARB's website listed below.

Inquiries Goncerning the substance of the proposed regulation may be directed to the designated agency contact persons, Mr. Richard Boyd, Manager, Process Evaluation Section, at (916) 322-8285, or Mr. Renaldo Crooks, Air Pollution Specialist, at (916) 327-5618.

Further, the agency representative and designated back-up contact persons, to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Lori Andreoni, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Trini Balcazar, Regulations Coordinator,

(916) 445-9564. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is ava"ilable for inspection upon request to the contact persons.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website "for this rulemaking at www.arb.ca.gov/regac¥2009/1andfills09/1andfills09.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulation are presented below.

Pursuant to Government Code section 11346.5(a)(5), the Executive Officer has determined that the proposed regulation would possibly impose a mandate on local agencies or school districts, which is not reimbursable under the Government Code because the proposed regulation applies to all entities that own or operate landfills and does not impose unique requirements. The Executive Officer has further determined pursuant to Government Code section 11346.5(a)(6) that the proposed regulation would result in some additional costs to ARB and other State agencies. In addition, the Executive Officer has also determined pursuant to Government Code Section 11346.5(a)(6) that the proposed regulatory action would possibly create a cost to any local agency or school district that is not required to be reimbursed under part 7 "(commencing with section 17500) of division 4 of the Government Code, or may impose other nondiscretionary costs or savings on local agencies. The Executive Officer further determined that the proposed regulation would not result in costs or savings in federal funding to the State.

The proposed regulatory action may create costs to local air pollution control and air quality management districts (Districts). However, these costs are recoverable by fees that are within the Districts' authority to assess (see Health and Safety Code section 42311) and are also specifically provided for in the proposed regulation.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts that representative private persons or businesses might incur in reasonable compliance with the proposed regulation. The Executive Officer has initially assessed that there will be a potential cost impact on private persons or businesses directly affected as a result of the proposed. regulatory action.

The cost to affected public agencies and to affected persons and businesses would be approximately $27 million dollars in initial capital costs with about $6 million to $14 million dollars in annual recurring costs (in 2008 dollars). Over the 23-year life of the regulation, this corresponds to a total cost of approximately $340 million dollars. The cost-effectiveness is estimated to be approximately $9 per metric ton of carbon

dioxide equivalent reduced. Affected persons and businesses may also incur an additional cost for any fees Districts assess.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code sections 11346.3 and 11346.5(a)(10), the Executive Officer has determined that the proposed regulatory action may lead to creation of some businesses. Due to the longer compliance lead-time for closed landfills, as well as the opportunity to delay control system installation through improved landfill surface maintenance, and multiple available funding mechanisms, ARB staff believes that landfill owners and operators will be able to meet the compliance costs. Businesses that may be created or expanded include those that design, furnish, install, monitor, and maintain landfill gas collection and control systems, as well as those that provide alternative compliance strategies (inclUding waste-to-energy technologies). Existing businesses that provide the aforementioned scope of services and products are likely to see an increase in business due to the requirements of the proposed regulation. Additionally, the proposed regulation may lead to the creation or expansion of jobs in those sectors assisting facilities with compliance. The proposed regulation is not expected to result in the elimination of any jobs or businesses.

The Executive Officer has also determined, pursuant to California Code of Regulations, title 1, section 4, that the proposed regulatory action would not have an affect on small businesses. The businesses affected by the proposed regulation do not meet the definition of small business in Government Code section 11342.610.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

A detailed assessment of the economic impacts of the proposed regulation can be found in the ISOR.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board or that has otherwise been identified and brought to the attention of the Board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by email before the hearing. To be considered by the Board, written submissions not physically submitted at the hearing must be received no later than 12:00 noon (Pacific Standard Time), June 24, 2009, and addressed to the following:

Postal mail is to be sent to:

Clerk of the Board
Air Resources Board
1001 I Street
Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Gov. Code § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and other search engines.

The Board requests, but does not require, that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff, in advance of the hearing, any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted to ARB under Health and Safety Code sections 38501, 38510, 38560, 38560.5, 38580, 39600, and 39601. This action is proposed to implement, interpret, or make specific Health and Safety Code sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 38561, 38563, 38580, 39003, 39500,.39600, 39601, and 41511.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action; in such event the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

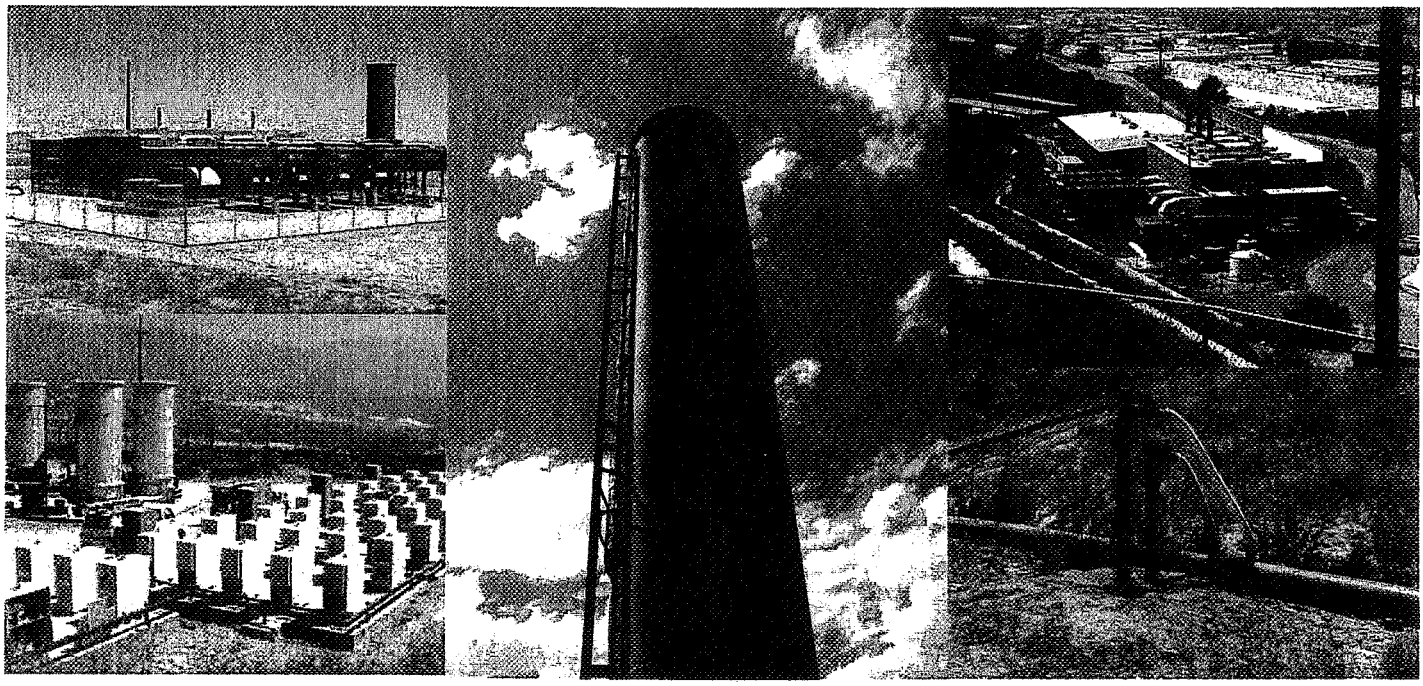
James N. Goldstene
Executive Officer

Date: April 28, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at *www.arb.ca.gov.*

California Environmental Protection A enc
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR THE PROPOSED REGULATION TO REDUCE METHANE EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS



Stationary Source **Division**
Emissions Assessment Branch

May 2009

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider

PROPOSED REGULATION TO REDUCE METHANE EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS

To be considered by the Air Resources Board on June 25-26,2009, at:

California Environmental Protection Agency Headquarters
Byron Sher Auditorium
1001 I Street
Sacramento, California

Air Resources Board
P.O. Box 2815
Sacramento, California 95814

[This page is intentially blank.]

State of California
AIR RESOURCES BOARD

PROPOSED REGULATION TO REDUCE METHANE EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS

Staff Report

Prepared by:

Stationary Source Division
California Air Resources Board

Lead Authors

Renaldo Crooks
Jon Manji
Ziv Lang

Contributing Authors

Carolyn Suer
Larry Hunsaker

Legal Counsel

Aron Livingston, Esq., Office of Legal Affairs

Reviewed by:

Robert Fletcher, Chief, Stationary Source Division
Dan Donohoue, Chief, Emission Assessment Branch
Richard Boyd, Manager, Process Evaluation Section

May 8,2009

Acknowledgements

This report was prepared with assistance and support from other divisions and offices of the Air Resources Board and with cooperation from many other individuals and organizations. In particular, we wish to acknowledge the assistance of Reza Mahdavi, Kamran Adili, James McCormack, and Ron Walter of the Air Resources Board; and Scott Walker, Stephanie Young, and Todd Thalhammer of the California Integrated Waste Management Board. We also wish to thank the following individuals:

Local Air Districts

Carol Allen and Linda Carey, Bay Area Air Quality Management District
Charles Tupac, South Coast Air Quality Management District

Local Municipalities

William Theyskens, City of Sunnyvale
Michael Carroll, San Joaquin County Public Works
Tim Reed and Eric Greenwood, Kern County Waste Management Department
Chris Gonaver, City of San Diego
Tim Pike, City of Mountain View

Environmental Organizations

Scott Smithline and Nick Lapis, Californians Against Waste
Bill Magavern, Sierra Club California

Solid Waste Industry

Anthony Pelletier, Allied Waste Industries|West Region
Frank Caponi, County Sanitation Districts of Los Angeles County
Rachel Oster, Norcal Waste Systems, Inc.
David Zeiger, Republic Services
Charles White, Waste Management
Chuck Helgert, Sector Strategies
Tom Reilly, Waste Connections; Inc.
Pat Sullivan, SCS Engineers
Don Augestine, IEM, Inc.
Ramin Yazdani, County of Yolo
Rick Roberts and Earl Roberts, RES Environmental
Richard Merrill, Golder Associates, Inc.

Military

Herbert Roraback and Laweeda Ward, Edwards Air Force Base

Staff Report: Initial Statement of Reasons

Proposed Regulation to Reduce Methane Emissions from Municipals Solid Waste Landfills

TABLE OF CONTENTS

Contents

Contents (Cont.)

LIST OF TABLES

ACRONYMS

AB	Ass"embly Bill "
AB32	Assembly Bill 32, California Global Warming Solutions Act 2006
AERMOD	Air Dispersion Model
APCD	Air Pollution Control District
APCO	Air Pollution Control Officer
AQMD	Air Quality Management District
ARB/Board	Air Resources Board
BAAQMD	Bay Area Air Quality Management District
BMP	Best Management Practices
Btu	British Thermal Units
Btu/ft^3	British Thermal Units per Standard Cubic Foot
Btu/hr	British Thermal Units per Hour
eCA	California Clean Air Act
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CIWMB	California Integrated Waste Management Board
CO	Carbon Monoxide
C02	Carbon Dioxide
C02E	Carbon Dioxide Equivalent
CFR	Code of Federal Regulations
CNG	Compressed Natural Gas
DTSC	Department of Toxic Substances Control
EG	Emission Guidelines
EO	Executive Order
FOD	First-Order Decay
GHG	Greenhouse Gas
GWP	Global Warming Potential
HAP"	Hazardous Air Pollutant
H&S Code	Health and Safety Code
IPce	Intergovernmental Panel on Climate Change
IC Engines	"Internal Combustion Engines
ICLEI	International Council for Local Environmental Initiatives
ISC	Industrial Source Complex
ISOR	Initial Statement of Reasons
k	Factor tied to moisture content of landfill
LACSD	Los Angeles County Sanitation District
LandGEM	Landfill Gas Emissions Model
LCRS	Leachate Collection Removal System
LEA	Local Enforcement Agencies
LFG	Landfill Gas
LFGTE	Landfill Gas-to-Energy
LNG	Liquefied Natural Gas

ACRONYMS (Cont.)

Lo	Potential Methane Generation Capac.ity
MMBtu/hr	Million British Thermal Units per hour
MMT	Million Metric Tons
MMTCOzE	Million Metric Tons of Carb.on Dioxide Equivalents
MTCOzE	Metric Tons of Carbon Dioxide Equivalents
MSW	Municipal Solid Waste
NzO	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMOC	Non-Methane Organic Compounds
NOx	Nitrogen Oxide Compounds
NSPS	New Source Performance Standards
ORS	Optical Remote Sensing
OSHA	Occupational Safety and Health Administration
pH	Acidity of Substance
PM	Particulate Matter
PPM	Parts Per Million
ppmv	Parts Per Million by Volume
PVC	Polyvinyl Chloride
RPM	Radial Plume Mapping
RWQCB	Regional Water Quality Control Boards
SCAQMD	South Coast Air Quality Management District
SWISID	Solid Waste Information System Identification Number
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminant
U.S. EPA	United States "Environmental Protection Agency
VOC	Volatile Organic Compound
WIP	Waste-in-Place

State of California
AIR RESOURCES BOARD

Executive Summary

I. INTRODUCTION

A. Overview

The California Air Resources Board (ARB or Board) staff is proposing a regulation to reduce methane emissions from municipal solid waste (MSW) landfills. Methane is a major contributor to climate change, having a global warming potential of about 21 times that of carbon dioxide (CO_2), the most common greenhouse gas (GHG). Methane has a relatively short atmospheric lifetime of about 10 years. Changes in a methane source's emissions level can affect atmospheric GHG concentrations in a relatively short time scale.

In 2006, the Legislature passed and Governor Schwarzenegger signed the California Global Warming Solutions Act of 2006 (Assembly Bill 32; Stats. 2006, chapter 488). In Assembly Bill (AB) 32, the Legislature declared that global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. AB 32 creates a comprehensive, multi-year program to reduce GHG emissions in California, with the overall goal of restoring emissions to 1990 levels by the year 2020. AB 32 requires ARB to take actions that include:

- Establishing a statewide GHG emissions cap for 2020, based on 1990 emissions;
- Adopting a scoping plan by January 1, 2009, indicating how emission reductions will be achieved from significant GHG sources via regulations, market mechanisms,and other actions;
- Adopting a list of discrete, early action GHG emission reduction measures by June 30, 2007, which can be implemented and enforced no later than January 1, 2010; and
- Adopting regulations by January 1,2010, to implement the measures' identified on the list of discrete early action measures.

In June 2007, the Board identified a measure to reduce methane emissions from MSW landfills as a discrete early action measure. This proposed regulation was developed to implement this early action measure. The proposed regulation was developed in close collaboration with California Integrated Waste Management Board (CIWMB) staff.

The proposed regulation would require owners and operators of certain smaller and other uncontrolled landfills to install gas collection and control systems. The proposed regulation also includes requirements to ensure that existing and newly installed gas

collection and control systems are operating optimally. There are about 367 landfills currently in ARB's landfill emissions inventory that have the potential to generate methane emissions. Of these, 218 landfills (14 of which are u.ncontrolled) may be subject to the proposed regulation. The remaining landfills are likely to qualify for an exemption.

Based on ARB staff's 2020 forecast of landfill emissions, if all 14 of the uncontrolled landfills were to install gas collection and control systems for methane, there would be a reduction of about 0.4 million metric tons of carbon dioxide equivalents ($MMTCO_2E$). The implementation'and enforcement of this proposed regulation for the remaining estimated 204 affected MSW landfills (including those with gas collections systems already installed) is expected to result in an additional estimated emission reduction of 1.1 $MMTCO_2E$. Overall, the proposed regulat.ion will result in reductions of about 1.5 $MMTCO_2E$ in2020 at an average cost of about $9 per metric ton of carbon dioxide equivalent ($MTCO_2E$) reduced. This is equivalent to an average increase of about 10 cents per month to the waste disposal cost per California household.

In developing this proposed regulation, staff evaluated economic and environmental impacts and found no significant adverse impacts. Staff also found that reducing methane emissions would have a beneficial impact on climate change and would further reduce emissions of toxic compounds and ozone precursors that are also present in landfill·gas.

B. Background

1. Why is ARB proposing to control methane emissions from MSW landfills?

In California, MSW landfills are the second largest anthropogenic source of methane and are an important source of GHG emissions that must be reduced to meet the goals of AB 32. The organic portion of solid waste disposed in MSW landfills decomposes to form landfill gas. Approximately 1.2 billion tons of solid waste has accumulated in the State's landfills with an additional 40 million tons being added each year. In 1990, GHG emissions from MSW landfills were estimated to be about 6.3 $MMTCO_2E$; in 2000 the GHG emission level dropped to 5.8 $MMTCO_2E$ and returned to 6.3 $MMTCO_2E$ in 2006. These emissions are forecasted to increase to approximately 7.7 $MMTCO_2E$ in 2020. Emissions from MSW landfills represent about 1 percent of the statewide greenhouse gas inventory. If not captured, combusted, or treated in control systems, landfill gas can either be released into the atmosphere as fugitive emissions or migrate underground to cause groundwater contamination.

2. How is'landfill gas formed?

Landfill gas is produced naturally by the aerobic (with air) and anaerobic (without air) decomposition of organic waste in MSW landfills. MSW is compacted and buried and the buried wastes decompose over time. Since the wastes are insulated from outside air, decomposition occurs anaerobically producing large qu'antities of methane. In

general, landfill operators are required to provide a daily cover of soil or other approved material over the waste that is received by the landfill to prevent odors and other nuisanGes. '

Landfill gas typically consists of roughly '50 percent methane and 50 percent CO_2, with trace levels of non-methane organic compounds (NMOC). NMOCs represent less than 1 percent of landfill gas and they include volatile organic compounds (VOC), toxic air contaminants, and odorous compounds.

3., How is landfill gas controlled?

Methane emissions from MSW landfills are controlled by first containing the gas by using soil, compacted clay, geomembrane, biocovers, or other surface covers, and then capturing the gas through the installation and operation of gas collection and control systems. These systems consist most commonly of vertical wells and in some cases horizontal trenches that are buried within the waste and connected to header pipes which route the gas to a pump or blower station. Vacuum applied to the wells by a pump or blower draws the gas to a control device, such as a flare, internal combustion engine, boiler,gas turbine, or microturbine. The collected gas can either be combusted, used to produce energy, or purified for offsite use.

4. What does the proposed regulation require?

The proposed measure will require the installation and proper operation of gas collection and control systems at active, inactive, and closed MSW landfills having 450,000 tons of greater of waste-in-place and that received waste after January 1, 1977. The proposed regulation contains performance standards for the gas collection and control system, and specifies monitoring requirements to ensure that that the system is being maintained and operated in a manner to minimize methane emissions. The proposed standards include a leak standard for gas collection and control system components, a monitoring requirement for wellheads, methane destruction efficiency requirements for most control devices, surface methane emission standards, and reporting requirements.

5. Are there any applicable federal or local air district landfill regulations?

MSW landfills are regulated under local air district rules that implement the requirements of the federal New Source Performance Standards (NSPS) and Emission Guidelines (EG) (40 CFR Part 60 Subparts WWW and Cc) for MSW landfills. The NSPS applies to "new" MSW landfills that commenced construction, modification, or reconstruction on, or after May 30, 1991. The EG applies to "existing" MSW landfills that commenced construction, modification, or reconstruction before May 30, 1991, and that have accepted waste at any time since November 8, 1987, or have additional capacity for future waste deposition. The NSPS and EG require the installation of a landfill gas collection and control system when a MSW landfill reaches a design capacity of 2.75 million tons or greater and has a non-methane organic compound

emission rate of 55 tons per year, or greater. The United States EilVironmental Protection Agency (U.S. EPA) promulgated the National Emission Standards for Hazardous Air Pollutants (NESHAP) for MSW landfills (40 CFR Part 63 Subpart AAAA) on January 16, 2003. The NESHAP has the same requirements' as the NSPS but also contains provisions for start-up, shut-down,and additional recordkeeping and reporting requirements.

The local air districts implement the federal requirements for MSW landfills. Additionally, many districts also issue permits to construct and operate landfill gas collection systems and control equipment used at landfills. Some districts, such as the Bay Area Air Quality Management District (BAAQMD) and the South Coast Air Quality Management District (SCAQMD), also have their own rules that apply more stringent requirements, such as sLirface emission standards and monitoring requirements, in order to achieve reductions of NMOCs beyond what the federal regulations require.

The proposed regulation differs from federal NSPS and NESHAP requirements and local air district rules in that it, in 'general, applies to smaller landfills (in addition to larger landfills) and has more stringent requirements for methane collection and control, and component leak testing and surface emissions monitoring. The more stringent requirements in the proposed regulation are necessary to maximize cost-effective GHG emission reductions. Since the requirements of the proposed regulation are more stringent, they do not conflict with or impede compliance with existing federal and local air district requirements.

II. SUMMARY OF THE PROPOSED MEASURE

The proposed regulation will require the installation of a gas collection and control system at certain MSW landfills. The proposed regulation contains performance standards for the gas collection and control system, and specifies monitoring requirements to ensure that that the system is being maintained and operated in a manner to minimize methane emissions. The key sections of the proposed measure are discussed below.

A. Applicability and Exemptions

The proposed regulation applies to all MSW landfills that received solid waste after January 1, 1977. This date excludes approximately 1,500 closed, illegal, or abandoned disposal sites, including burn dumps and other types of sites that are not likely to generate landfill gas. MSW landfills having greater than, or equal to 450,000 tons of waste-in-place would be required to install active gas collection and control systems and comply with the requirements of the proposed regulation unless exemption conditions are met.

Active MSW landfills having less than 450,000 tons of waste-in-place are exempt from the substantive requirements of the proposed regulation; however, the owner or

operator must comply with limited reporting requirements. Staff is proposing to exempt landfills meeting the above conditions from the substantive requirements because it is unlikely that these landfills will generate sufficient gas to support a gas collection and control system. Closed and inactive MSW landfills having less than 450,000 tons of waste-in-place are exempt from the proposed regulation because they are not expected to generate sufficient amounts of landfill gas to support a control device operating on a continuous basis without the use of supplemental fuel. Hazardous waste landfills and landfills containing only construction and demolition waste or non-decomposable solid waste, which is incapable of degrading biologically to form significant amounts of landfill gas, are also exempt from the requirements of the proposed regulation.

B. Determination for Installing a Gas Collection and Control System

If a MSW landfill has 450,000 tons of waste-in-place or greater, the owner or operator must determine if they are required to install a gas collection and control system based on the landfill's gas heat input capacity. The proposed regulation uses a landfill gas input heat capacity threshold of 3.0 million British thermal units per hour (MMBtu/hr) to determine if a MSW landfill may is able to sustain a gas control system, operating on a continuous basis, without the need for supplemental fuel.

If the landfill gas heat input capacity is less than 3.0 MMBtu/hr and the MSW landfill is active, the landfill gas heat input capacity is recalculated annually until it is determined to be either greater than or equal to 3.0 MMBtu/hr or the landfill closes and ceases to accept waste. If the MSW landfill is closed or inactive and the landfill gas heat input capacity is less than 3.0 MMBtu/hr, a gas collection and control system is not required and the requirements of the proposed regulation no longer apply.

If the landfill gas heat input capacity is greater than or equal to 3.0 MMBtu/hr, the owner or operator must either install a gas collection and control system, or demonstrate that after four consecutive quarterly monitoring periods there is no leak at any location on the landfill surface that exceeds a methane concentration of 200 parts per million by volume (ppmv) or greater. If the MSW landfill is active and there is no leak exceeding 200 ppmv, the owner or operator must recalculate the landfill gas heat input capacity annually until either the MSW landfill requires a gas collection and control system or closes and ceases to accept waste. If the MSW landfill is closed or inactive and there is no leak exceeding 200 ppmv, a gas collection and control system is not required and the owner or operator only needs to comply with limited reporting requirements.

C. Gas Collection and Control System Requirements

The proposed regulation requires the installation of a properly designed and operated gas collection and control system that minimizes methane emissions. The proposed regulation requires a Design Plan to be prepared by a professional engineer registered with the State of California and submitted to the Executive Officer for approval. The Design Plan details how the design of the collection system will handle the landfill's methane generation potential and maintain negative pressure at all wellheads. It also

specifies the gas control devices that will be used. Any owner or operator of an active landfill subject to the proposed regulation must install an active gas collection and control system within 18 months after approval of the Design Plan. Closed or inactive MSW landfills, which do not directly generate revenue, are provided an additional 12 months (for a total of 30 months after approval of the Design Plan) in order to obtain the necessary funds to comply. The proposed regulation also includes a provision for amending the Design Plan to respond to changes in site conditions.

The proposed regulation requires gas control devices, such as enclosed flares, rich-burn engines, boilers, gas turbines, and microturbines to meet a methane destruction efficiency of at least 99 percent. However, lean-burn engines, which can not meet this standard, are allowed if they are able to meet a 3,000 ppmv outlet methane concentration limit (dry basis, corrected to 15 percent oxygen). Requiring these engines to shut-down would result in a reduction of electrical generation capacity in the state and would unnecessarily affect the State's electrical supply. The collected landfill gas may also be routed to an offsite pipeline or to a treatment system for cleanup and subsequent use as a natural gas fuel, either in transportation or stationary sources.

D. Surface Methane Emission Standards

The proposed measure includes emission standards for both instantaneous and integrated monitoring of the landfill surface. Instantaneous monitoring is used to identify fugitive emissions from holes, cracks, or fissures in the landfill surface. Integrated monitoring is a good indicator of how well the gas collection system is operating overall. The proposed regulation establishes a 500 ppmv instantaneous surface monitoring standard and a 25 ppmv integrated surface monitoring standard to ensure that the gas collection system is adequately controlling emissions. The 500 ppmv instantaneous standard is currently being implemented at MSW landfills having existing gas collection and control systems (installed pursuant to existing regulations for NMOCs) and will continue to be implemented.

Most landfill operators, however, do not currently conduct integrated surface monitoring, and uncontrolled landfills do not currently test for compliance with either surface standard. Staff is proposing that these requirements become effective January 1, 2011. This effective date allows sufficient time for landfill owners and operators to become familiar with the surface standards and make the appropriate adjustments to their operating practices. Landfills required to install new gas collection and control systems are required to meet these standards upon commencing operation of the system. It should be noted that landfills that are currently subject to local or federal landfill rules will need to continue to ensure compliance with the 500 ppmv instantaneous standard.

E. Alternative Compliance Options

The proposed regulation recognizes the site-specific nature of landfills and provides flexibility allowing owners and operators to request alternatives to test methods, monitoring requirements, and operational requirements, subject to approval of the

Executive Officer. Owners and operators will need to demonstrate why consideration of an alternative is necessary in order to comply with the proposed regulation. They must also demonstrate that requested alternatives provide equivalent levels of methane emission control and enforceability.

F. Monitoring and Test Procedures

1. Surface Emissions Monitoring

The proposed regulation specifies procedures for conducting instantaneous and integrated surface monitoring. In both cases, the landfill is divided into individually identified 50,000 square foot grid patterns. This allows for better identification and tracking of any surface leaks or problem areas. Monitoring is performed quarterly using a portable hydrocarbon detector, such as an organic vapor analyzer or a toxic vapor analyzer set in flame ionization detector mode. The walking pattern must be no more than a 25-foot spacing interval and must traverse each monitoring grid. Landfill owners and operators have three opportunities to repair or remediate any leaks before a leak constitutes a violation. If the landfill owner or operator has no exceedances of the surface methane emission standards after four consecutive quarterly monitoring periods, the monitoring procedures provide an incentive which allows the walking pattern spacing to be increased to·100-foot intervals. Additionally, closed and inactive landfills can increase their sampling period from quarterly to annually. The increased spacing and sampling period can continue to be used as long as the landfill remains in compliance with surface standards. This provision decreases the compliance cost for well-controlled landfills.

Landfill owners or operators of closed or inactive MSW landfills, or any closed or inactive areas on an active MSW landfills, have an additional incentive for early compliance. To qualify for this incentive, the landfill must demonstrate that in the past three years prior to the effective date of the proposed regulation that there were no measured exceedances of the surface methane emission standards by annual or quarterly monitoring. If a successful demonstration is made, the landfill owner or operator may monitor compliance with the surface methane emissions standards annually and may increase thewalking pattern spacing from 25-foot to 100-foot intervals. The increased spacing and sampling period can continue to be used as long as the.landfill remains in compliance with the surface methane emission standards.

2. Gas Control System Equipment Monitoring

The proposed regulation contains a component leak standard of 500 ppmv. The purpose of the component leak testing requirement is to ensure that there are no point sources along the positive pressure side of the gas transfer path with methane . concentrations exceeding 500 ppmv. Landfills are required to conduct this monitoring quarterly. Additionally, the proposed regulation specifies monitoring parameters for gas

control devices such as flares to ensure thatthese devices are operating optimally and meeting the destruction efficiency standards.

3. Wellhead Monitoring

Monthly well monitoring is required to demonstrate that the gas extraction rate for an active gas collection system is sufficient. This requirement (in conjunction with the surface emission standards) helps to minimize groundwater impacts by ensuring that methane is routed through the gas collection system to a gas control device. A negative pressure must be maintained ateach wellhead, except under certain conditions (a landfill subsurface fire, fire prevention, repair of the gas collection system, or construction activities). If a positive pressure is measured, the owner or operator must initiate corrective action within five days. If the corrective action is not successful, an expansion of the gas collection may be necessary and must be completed within 120 days of the date the positive pressure was measured.

G. Recordkeeping and Reporting Requirements

In order to assure and monitor compliance with the requirements of the proposed regulation, landfill owners and operators are subject to recordkeeping and reporting requirements. These requirements include maintaining records of a landfill's waste acceptance rates, instantaneous and integrating surfacing sampling measurements, component leak checks, equipment downtime, gas flow rates, and control device destruction efficiency testing. Most records are required to be kept for a five-year period; however, control device records must be maintained for the life of the control device. Some of these recordkeeping items are required to be included in the annual report, which must be submitted annually and cover the period of January 1 through December 31 of each year. Additionally, there are some specific reports that need to be submitted under specific conditions, such as a waste-in-place report for landfills with less than 450,000 tons of waste-in-place or a closure notification report for landfills that are ceasing waste acceptance and closing. Additionally, an equipment removal report is required when a landfill is seeking to decommission the gas collection and control system. These reporting requirements are similar to what is already required in local air district and federal rules for many landfills in California.

III. IMPACTS OF THE PROPOSED REGULATION

A. Emissions and Emissions Reductions

Based on ARB staff's estimate, there would be a reduction of about 0.4 MMTC0_2E due to bringing 14 uncontrolled MSW landfills into compliance with the proposed regulation in 2020. The implementation and enforcement of this proposed regulation for the remaining estimated 204 affected MSW landfills (including those with gas collections systems already installed) is expected to result in an additional estimated emission reduction of 1.1 MMTC0_2E in 2020. This total 1.5 MMTC0_2E emission reduction

exceeds the initial emission reduction estimate of 1.0 MMTC02E from MSW landfiHs presented in the AB 32 Scoping Plan approved in·December 2008.

B. Economic Impacts

As part of the economic·impact assessment performed by ARB, compliance costs incurred by affected entities are estimated. Two of the main measures of cost are the proposed regulation's total cost and the cost-effectiveness (expressed in dollars spent per metric ton of pollutant reduced).

The cost to affected public agencies and to affected government agencies and businesses would be approximately $27 million dollars in initial capital costs and between $6 million to $14 million dollars in annual recurring costs (in 2008 dollars). Over the 23-year life of the regulation, this corresponds to a total cost of approximately $340 million dollars. These costs are summarized in the Table ES-1 below.

Table ES-1. Estimated Compliance Costs for All Affected Landfills

Landfill Compliance Status	Reporting Costs [1]	Capital Costs [2]	Operation and Maintenance Costs [3]	Monitoring Costs [4]
Landfills Subject to Reporting Requirements Only	$139,000	*N/A*	*N/A*	*N/A*
Landfills Having Existing Compliant Control Systems	$154,000	$2.4 million	$56 million	$151 million
Landfills Without Existing Compliant Control Systems	$13,000	$25 million	$92 million	$8.6 million
Totals	$308,000	$27 million	$148 million	$154 million

1. Costs to affected landfills to prepare and submit required WIP and Landfill Gas Heat Input Capacity reports.
2. Includes engineering, permitting, testing, purchase, installation, shipping, and other initial costs related to the set-up of a new gas collection and control system.
3. Recurring costs for the operation of a gas collection and control system; includes parts and materials, labor, utilities, taxes, and administration.
4. Monitoring costs include the purchase of monitoring and calibration equipment as well as labor for performing monitoring work as required in the proposed regulation.

The cost-effectiveness is estimated to be approximately $9 per MTC02E reduced. Over the 23-year lifetime of the regulation, the total cost of the proposed regulation expressed on a per-household basis is about 10 cents per month.

The majority of the affected landfills are owned and/or operated by public entities at the local, State, or federal level. ARB staff believes that most, if not all, of these public entities, as well as affected private businesses, will be able to meet the proposed regulation's compliance costs. However, itis possible that a small number of

businesses (those with marginal profitability) may experience financial difficulty in complying with the proposed regulation. Further discussion of the economic impacts of the proposed regulation can be found in Chapter VII of this report.

C. Environmental Impacts

No significant adverse environmental impacts are expected to occur from adoption of and compliance with the proposed regulation. The implementation of the proposed regulation may slightly increase criteria pollutant emissions such as oxides of nitrogen (NO_X) and carbon monoxide (CO) if landfills installed energy recovery systems such as an internal combustion (IC) engine. However, since these systems are typically installed at very large landfills (greater than one million tons of waste-in-place) as part of energy-recovery projects and are very costly compared to an enclosed flare, this increase is not expected. In addition, energy recovery systems such IC engines may slightly increase criteria pollutants as compared to flaring the gas, which would be required if there was no energy recovery system.

D. Health Impacts

The compound subject to the proposed measure is the GHG methane. Methane is not a hazardous air pollutant or carcinogen; however, toxic contaminants such as vinyl chloride, benzene, ethylene dibromide, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene are present in landfill gas. By installing gas collection and control systems at MSW landfills that are currently uncontrolled and ensuring that existing and newly installed gas collection and control systems are operated optimally, toxic air contaminants contained in the landfill gas will also be reduced, thereby minimizing the public's potential exposure to these compounds. Staff therefore concludes that public health will not be adversely affected by the proposed measure. Compliance with the proposed regulation is not expected to result in any adverse localized impacts.

IV. KEY ISSUES

A. Instantaneous Surface Monitoring Standard

During the development of the proposed regulation, ARB staff had initially proposed an instantaneous surface methane emission standard of 200 ppmv. However, stakeholders expressed concern that the 200 ppmv surface methane emission limit may cause landfill fires, decrease the ability to meet federal wellhead monitoring limits for oxygen and nitrogen, and interfere with landfill gas-to-energy projects. ARB staff requested that stakeholders submit documentation to support their concerns; however, the documentation was not available because under existing requirements landfill owners and operators are only required to report exceedances over 500 ppmv. Additionally, CIWMB's landfill fire expert also expressed a concern about the potential for landfill fires associated with a 200 ppmv instantaneous surface standard.

In the absence of data to verify whether or not landfill fires may increase as a result of a 200 ppmv limit, instantaneous surface methane concentration levels were set at 500 ppmv. However, the proposed regulation requires reporting of instantaneous readings of 200 ppmv and greater in an effort to collect additional data to help ARB staff determine the range of surface methane emission levels at landfills that fall below 500 ppmv and whether or not landfill fires are reported. Staff will analyze this data and return to the Board at a future date if the collected data indicates that a lower surface emission standard is feasible and does not result in landfill fires.

B. Phase-in of the Integrated Surface Monitoring Standard

Stakeholders expressed concern that the majority of landfill operators would be unfamiliar with conducting integrated surface monitoring and would need time to make the necessary system adjustments and improvements, establish monitoring protocols and procedures, purchase monitoring equipment, train staff, and develop recordkeeping and reporting systems in order to comply with the proposed 25 ppmv integrated surface sampling standard. The indicated preference was to use 50 ppmv, which is the current standard in SCAQMD Rule 1150.1, and implement a data collection scheme and use that information to phase-in a lower standard at some point in the future. Based on the compliance data obtained from SCAQMD, ARB staff believes that a 25 ppmv standard is feasible now. However, it is reasonable to expect that some landfills will require some time to make the necessary adjustments to their gas collection and control systems and operational practices, as appropriate. Therefore, the proposed regulation includes the 25 ppmv standard but establishes an effective date for compliance with this standard on January 1,2011 (about one year after the effective date of the proposed. regulation).

V. PUBLIC OUTREACH

Staff has made. extensive efforts to provide opportunities for participation in the rulemaking process. Staff's public outreach efforts included meetings with stakeholders through a series of seven technical workgroup meetings and three public workshops. These groups included representatives from the solid waste industry, local air districts, local enforcement agencies, CIWMB, U.S. EPA, environmental organizations, and other interested parties. Staff also created a website and maintained an email address list to automatically update interested parties about rulemaking developments. The website can be accessed at: http://www.arb.ca.gov/ccllandfills/landfills.htm.

VI. ENVIRONMENTAL JUSTICE

On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for integration of environmental justice into ARB's programs, consistent with the directive of California state law. These policies apply to all communities in California, however, environmental justice issues

have been raised specifically in the context of low-income areas and ethnically diverse communities. The proposed regulation is consistent with our environmental justice policy to reduce health risk in all communities, including those with low-income and ethnically diverse populations, regardless of location. Potential risks from global warming due to GHGscan affect both urban and rural communities. Therefore, reducing emissions of GHGs from landfill operations will provide benefits to both urban and rural communities in the State, including low-income and ethnically diverse communities. The decrease in GHG emissions will occur in areas where landfill operations are generally located, which is typically far from most residential areas.

VII. IMPLEMENTATION AND ENFORCEMENT

The local air districts currently implement and enforce rules related to the control of hydrocarbons (including toxic compounds) from landfills and, pursuant to the Health and Safety Code, are the primary implementation and enforcement agency for airborne toxic control measures for stationary sources adopted by ARB. The proposed regulation is developed pursuant to AB 32, which did not directly provide a mechanism for the local air districts to implement and enforce regulations developed under AB 32. Therefore, the proposed regulation reflects ARB's role as primary monitor and enforcer of regulations adopted under AB 32. However, ARB staff is exploring mechanisms by which local air districts can participate as partners in the implementation and enforcement of the proposed regulation. ARB staff believes local air district participation is critical to assure compliance with the proposed regulation, to help attain GHG emission reduction goals, to reduce the cost of implementing the proposed regulation, and to reduce governmental redundancy. In addition, local air districts are familiar with landfill operations and currently issue permits and inspect landfills and related landfill gas and emissjons control equipment. Accordingly, the proposed regulation allows ARB to enter into agreements with local air districts to implement and enforce the proposed regulation, although it also ensures that ARB retains the necessary authority to monitor compliance and enforce the regulation directly. It also permits local air districts to assess fees to cover costs associated with these agreements.

VIII. RECOMMENDATION

ARB staff recommends the Board approve the proposed regulation presented in Appendix A of the staff report.

I. INTRODUCTION

This report presents ARB staffs technical justification and analysis of the proposed regulation to reduce methane emissions from MSW landfills. Methane is a potent GHG having a high global warming potential of about 21 times that of CO_2. The proposed rulemaking is designed in accordance with the discrete early action measure requirements asset forth in the California Global Warming Solutions Act of 2006 (AB 32, Chap. 488, Stats. 2006, Health and Safety Code Section 38500 *et seq.).*

A. Overview

AB 32 was signed into law in September of 2006. AB 32 creates a comprehensive, multi-year program to reduce GHG emissions in California, with the overall goal of restoring GHG emissions to 1990 levels by the year 2020. Pursuant to AB 32, ARB was required to identify a list of "discrete early action GHG reduction measures" by June 30,2007. Once on the list, these measures must be developed into regulatory proposals. Discrete early action measure must also be adopted and made enforceable before January 1, 2010, and achieve the maximum technologically feasible and cost-effective reduction in greenhouse gases toward achieving 2020 GHG emission limit levels. ARB is also required to develop market-based compliance mechanisms. Beyond the requirements of AB 32, the Governor's Executive Order EO-S-03-05 calls for an additional GHG reduction of80 percent by 2050.

In June 2007, the Board identified a measure to reduce methane emissions from MSW landfills as a discrete early action measure. MSW landfills generate landfill gas in which methane typically accounts for about 50 percent of the total landfill gas composition. Methane gas is produced by the anaerobic decomposition of organic waste in MSW landfills. Methane emissions are controlled by means of covers (such as geomembranes, soil, and compost) and by the installation and operation of gas collection and control systems. This proposed regulation was developed in close collaboration with California Integrated Waste Management Board (CIWMB) staff.

B. Summary of the Proposed Regulation

The proposed regulation applies to active, inactive, and closed MSW landfills that received solid waste after January 1, 1977, and have at least 450,000 tons of waste-in-place. Staff estimates that there will be 218 landfills that will be subject to the proposed regulation: These landfills will be required to install (if currently uncontrolled) 'and maintain landfill gas collection and control systems. These systems will significantly reduce the emissions of methane and other VOCs produced as organic materials decompose in landfills. The proposed regulation contains performance standards for gas collection and control systems, and specifies monitoring requirements to ensure that that the systems are being maintained and operated in a manner to minimize methane emissions.

ARB staff estimates that there are 14 uncontrolled landfills with at least 450,000 tons of waste-in-place that may generate sufficient gas to support the installation of a gas collection and control system. Based on ARB staffs 2020 forecast of landfill emissions, if all 14 of those' landfills were to install emission controls for methane, there would be a reduction of about 0.4 MMTC0_2E. The implementation and enforcement of this proposed regulation for the remaining estimated 204 affected MSW landfills (including those with gas collections systems already installed). is expected to result in an additional estimated emission reduction of 1.1 MMTC0_2E. The overall cost of the proposed regulation is about $9 per metric ton of carbon dioxide equivalent reduced. This is. equivalent to an increase of about 10 cents per month to the waste disposal cost per California household.

The proposed regulation includes monitoring requirements to ensure that gas collection and control systems are operating optimally and that fugitive emissions are minimized. Staff is proposing an instantaneous surface monitoring standard of 500 parts per million by volume (ppmv) and an integrated surface monitoring standard of 25 ppmv to ensure that the gas collection system is adequately controlling emissions. Instantaneous surface monitoring is used to monitor the integrity of the landfill surface and to identify point sources where methane may be escaping into the atmosphere (e.g., around cover penetrations,areas of distressed vegetation, cracks, or seeps in the landfill cover system). Integrated surface sampling accumulates and averages the instantaneous surface monitoring readings and provides a more direct means of revealing clusters of emissions that would indicate possible gas collection system problems. Landfill owners and operators are given the opportunity to repair leaks or make the appropriate adjustments to their gas collection and control systems before an exceedance of the standard is considered a violation.

Uncontrolled landfills, with 450,000 tons of waste-in-place or greater, must submit a Design Plan prepared by a registered professronal engineer. The Design Plan must provide for the control of the collected landfill' gas through the use of a gas collection and control system and be designed to collect gas at a sufficient extraction rate to maintain negative pressure at all wellheads (except under specified conditions). Active landfills must install an active gas collection and control system within 18 months after approval of the Design Plan. This compliance schedule should provide sufficient time for the operator to obtain the necessary local agency permits and for installation of the system. Closed and inactive landfills' that must install a gas collection and control system have up to 30 months to comply. This compliance schedule provides an extra year for closed or inactive landfills to secure the necessary funds to comply.

Beginning January 1, 2011, owriersand operators that are required to install a gas collection and control system, or are already operating a gas collection and control system, must monitor the surface of their landfills to ensure compliance with the surface methane emissions standards. This compliance schedule allows landfill owners or operators time to make the necessary system adjustments'and improvements, establish monitoring protocols and procedures, purchase monitoring equipment, train staff, and develop recordkeeping and reporting systems.

C. Need for the Proposed Regulation

In California, MSW landfills are the second largest anthropogenic source of methane and are an important source of GHGs that must be reduced to meet the goals of AB 32. The organic portion of solid waste disposed in MSW landfills decomposes to form landfill gas. Approximately 1.2 billion tons of solid waste has accumulated in the State's landfills with an additional 40 million tons being added each year. In 1990, GHG emissions from MSW landfills were estimated to be about 6.3 MMTCOzE; in 2000 the GHG emission level dropped to 5.8 MMTCOzE and returned to 6.3 MMTCOzE in 2006. These emissions are forecasted to increase to approximately 7.7 MMTCOzE in 2020. If not captured, combusted, or treated in control systems, landfill gas can either be released into the atmosphere as fugitive emissions or migrate underground to cause groundwater contamination. Accordingly, ARB staff recommends adoption of the proposed regulation.

II. REGULATORY REQUIREMENTS AND RELAVENT PROGRAMS

This chapter describes State law requirements related to setting GHG emission limits. It also summarizes existing regulation and programs that affect landfill operations.

A. Greenhouse Gas Reductions Through Early Actions

AB 32 requires the Board to identify a list of discrete early action GHG emission reduction measures by June 30,2007. Discrete early action measures are to be adopted and become legally enforceable (approved by the Office of Administrative Law) by January 1, 2010. The proposed regulation to reduce methane emissions from MSW landfills is one of the nine discrete early action measures listed by the Board.

B. AB 32 Requirements and Criteria

AB 32, the California Global Warming Solutions Act of 2006, creates a comprehensive, multi-year program to reduce GHG emissions in California. Health and Safety Code (H&S Code) section 38560.5 requires ARB to adopt regulations by January 1, 2010, to implement discrete early action GHG emission reduction measures. These measures, such as the proposed regulatory action, must achieve the maximum technologically feasible and cost-effective reductions in GHG emissions from the sources identified for early action measures.

AB32 contains additional standards in H&S Code section 38562 that apply to regulations that will be adopted for general emissions reductions consistent with ARB's scoping plan. Among other things, this section requires that reductions must be real, permanent, quantifiable, verifiable, and enforceable. ARB is also required to adopt rules and regulations in an open, public process. While section 38562 does not directly apply to early action measures enacted under section 38560.5, ARB is interested in ensuring that its early action measures, such as the proposed regulatory action, meets the broader criteria for the GHG reduction regulations that will follow.

The proposed regulatory action has been designated as a discrete early action measure and would reduce GHG emissions attributable to MSW landfills. Appendix E provides a discussion of why staff believes this proposed regulatory action meets the limited criteria applicable to discrete early.action measures, as well as further meets the later requirements of State law applicable to GHG measures generally.

C. Summary of Relevant Regulations and Related Programs

1. Federal Requirements

New Source Performance Standards (NSPS) and Emission Guidelines (EG)

MSW landfills are regulated under local air district rules that implement the requirements of the NSPS and EG (40 CFR Part 60 Subparts WWW and Cc) for MSW

landfills. The NSPS applies to "new" MSW landfills that commenced construction, modification, or reconstruction on, or after May 30, 1991. The EG applies to "existing" MSW landfills that commenced construction, modification, or reconstruction before May 30, 1991, and that have accepted waste at any time since November 8, 1987, or have additional capacity for future waste deposition. The NSPS and EG require the installation of a landfill gas collection and control system when a MSW landfill reaches a design capacity of 2.75 million tons or greater and has a non-methane organic compound emission rate of 55 tons per year, or greater.

ARB and the local air districts were required to develop and submit a "State Plan" to U.S. EPA for implementing and enforcing the requirements of the EG. Local air districts that elected not to adopt rules to implement the EG were placed under a Federal Plan, which is directly enforced by U.S. EPA. In general, the larger air districts adopted rules whereas several smaller districts are subject to the Federal Plan. U.S. EPA promulgated the NSPS and EG on March 12, 1996.

National Emission Standards for Hazardous Air Pollutants (NESHAP)

U.S. EPA promulgated the NESHAP for MSW landfills (40 CFR Part 63 Subpart AAAA) on January 16, 2003. The NESHAP has the same requirements as the NSPS but also contains provisions for start-up, shut-down, and additional recordkeeping and reporting requirem'ents. The proposed regulation differs from federal NSPS and NESHAP requirements in that it applies to smaller landfills (450,000 versus 2,750,000 tons of waste-in-place) and has more stringent requirements for methane collection and control, component leak testing and surface emissions monitoring, and compliance schedules. The more stringent requirements in the proposed regulation are needed to maximize GHG emission reductions. Since the requirements of the proposed regulation are more stringent, they do not conflict with or impede compliance with the existing federal requirements.

2. State Re'guirements

In addition to ARB, several state agencies, including CIWMB, the State Water Resources Control Board (SWRCB), and the Department of Toxic Substances and Control (DTSC), have regulatory authority over solid waste disposal operations. The responsibilities of each agency are discussed in the following paragraphs.

California Integrated Waste Management Board (CIWMB)

CIWMB is the State's lead agency for the management and recycling of solid waste. The California Code of Regulations (CCR), Title 27, Sections 20917 to 20939, requires monitoring and control of landfill gas. The landfill owner or operator is required to take action to control hazards or nuisances caused by landfill gas. A gas control system approved by the local enforcement agency is required if monitoring indicates gas is migrating offsite. Title 27, Sections 20510 to 20660 also contains operating and design

specifications for landfills as well as general requirements for leachate collection, treatment, and disposal.

After closure of the landfill, the owner or operator must maintain and repair the final cover of the landfill as needed, and maintain and operate a gas monitoring system. The owner or operator must prepare a written post-closure plan describing the monitoring and routine maintenance activities. Financial assurance criteria are included in the post-closure plan to ensure owners or operators have sufficient funds available to properly close the landfill.

California State Water Resources Control Board (SWRCB)

Specific requirements for the design and construction of landfills are contained in the CCR, Title 27; Sections 20310-20377, which is administered by SWRCB through the Regional Water Quality Control Boards (RWQCBs). These regUlations delineate classification (e.g., municipal, hazardous, etc.) and siting, and provide construction standards for waste management facilities. Leachate collection systems and monitoring programs are required to ensure surface and ground water is not contaminated by landfilling operations.

California Department of *Toxic Substances Control (DrSC)*

DTSC has the authority to regulate the management of hazardous waste and to clean up contaminated sites. DTSC also controls the acceptance of hazardous waste into landfills. If a hazardous waste landfill generates toxic gases in sufficient amounts to cause potential adverse health effects, the local air district, in consultation with DTSC, may require the installation of a gas collection and control system or other corrective action pursuant to California Health and Safety Code (H&S Code) Section 41805.5.

3. Local Air District Rules

Local air districts have adopted rules to implement the federal requirements for MSW landfills. However, the focus of these rules is to reduce VOC and NMOC emissions from MSW landfills, not methane. The following paragraphs provide examples of some of the landfill rules that are currently being implemented by the larger local air districts to reduce NMOC emissions.

South Coast Air Quality Management District (SCAQMD)

SCAQMD Rule 1150.1 addresses the control of gaseous emissions from active and inactive laridfiUs and requires the installation of a landfill gas control system that must be specifically operated and maintained. This rule also requires landfill owners or operators to monitor offsite gas migration and to determine the concentrations of organic compounds and toxic air contaminants emitted from the landfill. Under these requirements, a sufficient amount of landfill gas must be captured in the collection system to prevent the average concentration of total organic compounds over the

landfill surface from exceeding 50 ppmv. The maximum concentration of organic compounds measured as methane must not exceed 500 ppmv at any point on the surface of the landfill.

Bay Area Air Quality Management District (BAAQMD)

BAAQMD Regulation 8, Rule 34 requires the collection of landfill gas through a gas collection system at landfills with more than one million tons of waste-in-place. This rule establishes requirements for collecting and processing of landfill gases by either burning the gases in a flare or an internal combustion engine, processing the gases by a control device or facility demonstrated to reduce the amount of organic compounds by at least 98 percent by weight, or by collecting and processing the gases for delivery to a fuel distribution pipeline.

4. Local Enforcement Agencies'

Local Enforcement Agencies (LEA), such as city or county environmental health agencies, that are designated by the governing body of a county or city, and certified by CIWMB have the authority to implement CIWMB programs that ensure the correct operation and closure of MSW landfills. LEA responsibilities include the implementation of certain state regulations with respect to MSW landfill siting, construction, operation, closure, post-closure maintenance, and inspection requirements. LEAs are not expected to have a principal role in the implementation and enforcement of the proposed regulation.

5. Summary of Related Programs

Composting

CIWMB is pursuing activities for increasing the production and markets for compost and diverting organic materials from MSW landfills. These activities include an economic and life cycle assessment of organic diversion alternatives; compost-based best management practices (BMP); development of compost specifications for agriculture; and a study examining the effectiveness of using compost as cover material to mitigate methane from MSW landfills. Diversion of organic materials from MSW landfills can provide a significant reduction of GHG by removing methane-generating materials from landfilled waste.

Best Management Practice Guidance for Reducing Greenhouse Gases at Municipal Solid Waste Landfills

CIWMB sponsored a study to provide owners and operators of MSW landfills guidance on BMPs to reduce their GHG emissions. Prior to this study, there was no overall practical guide or roadmap to maximize landfill methane capture from landfills in California. The lack of such guidance presented a barrier for maximizing emissions reductions. The CIWMB study provides recommendations to optimize landfill design,

construction, operation, and closure and post-closure practices for GHG emissions reductions on a voluntary basis. The BMP guidance document compliments the proposed regulation and also supports potentialfuture CIWMB rulemaking in areas within CIWMB's regulatory purview not otherwise addressed by the proposed regulation.

Commercial Recycling

CIWMB is evaluating a measure that focuses on increasing commercial waste diversion. California has about 24,000 commercial businesses that generate over half of the statewide solid waste (ARB, 2008c). By recovering traditional recyclable materials from the commercial waste stream, with the goal of remanufacturing these materials, GHG emissions can be reduced and the use of virgin materials can be decreased.

Anaerobic Digestion and Waste-to-Energy

CIWMB is evaluating anaerobic digestion as means to reduce GHG emissions. Anaerobic digestion is a type of conversion technology that diverts organic materials, such as: green waste, food waste and other organic components from the waste stream to be utilized as feedstock for a digestion process that produces energy and displaces fuel or energy derived from fossil fuels in a sustainable manner. The energy derived from the anaerobic digestion process can be used in the form of LNG, CNG, or electricity for on-site energy needs. It may also (in some cases) be exported to the energy grid.

Mandatory Reporting

ARB's Mandatory Reporting of GHGs Regulation became effective January 1, 2009. MSW landfills are not required to do mandatory reporting of GHGs, except when the landfill operator has operational control of electric generating facilities and general combustion sources using landfill gas. MSW landfill operators with electricity generators rated 1 megawatt or higher and emitting at least 2,500 metric tons per year of CO_2 would be required to report emissions. Operators with flaring or other combustion emissions exceeding 2,500 metric tons per year of CO_2 are also required to report emissions.

III. MUNICIPAL SOLID WASTE LANDFILLS

This chapter provides an overview of MSW landfill GHG emissions and discusses the management of MSW, the methane generation process, methods for optimizing collection efficiencies, and control technologies for reducing methane emissions from MSW landfills.

A. Background

Methane is a major contributor to climate change, having a global warming potential of 21 times that of CO_2. In California, MSW landfills are the second largest anthropogenic source of methane (ARB, 2009b). The organic portion of solid waste disposed in MSW landfills decomposes to form landfill gas in which methane typically accounts for about 50 percent of the total landfill gas composition. Approximately 1.2 billion tons of solid waste has accumulated in the State's landfills with an additional 40 million tons being added each year (CIWMB, 2007c). About 94 percent of the total statewide estimated 1.2 billion tons of waste-in-place (WIP) is contained in landfills with gas control and control systems (CIWMB, 2007c). ARB staff estimates that fugitive emissions of methane from MSW landfills represent about 1 percent of the statewide gas GHG inventory. If not captured, combusted, or treated in control systems, landfill gas can either be released into the atmosphere as fugitive emissions or migrate underground to cause groundwater contamination.

B. Municipal Solid Waste Disposal and Recycling

1. Waste Generation and Disposal

MSW is a broad term which includes wastes such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. Examples of waste from these categories include appliances, paper, wood pallets, and cafeteria wastes. MSW does not include waste such as industrial process wastes, automobile bodies, municipal sludge, and combustion ash. As shown in Table 111-1, paper and other organic waste constitute the.two largest components of the MSW stream for both commercial and residential categories, followed by construction demolition, plastic, metals, and glass (CIWMB, 2004). Commercial sources accounted for approximately 72 percent or 37 million tons of all MSW in 2004, while residential sources accounted for about 28 percent or 14 million tons of all MSW in 2004 (CIWM.B, 2004).

Table 11l-1. Overview of California's Overall Waste Stream Sources in 2004

	Business (MMT)	Household (MMT)
Paper	13.2	4.0
Other Organics	12.3	6.6
Construction & Demolition	4.1	0.7
Plastic	3.8	1.3
Metal	2.4	0.7
Glass	1.1	0.6
Mixed Residue	0.2	0.6
Household Hazardous Waste	0.1	0.05
Special Waste	0.03	0.004
Total Waste	37	14
Percent Contributed to Total Waste	72	28

Source: Statewide Profile et al CIWMB, 2004.

Landfilling is basically a three step process consisting of: spreading the waste into thin layers; compacting the waste; and covering with soil. Methods for depositing the waste include the area fill method, the trench method, and the ramp method. In the area fill method, waste is placed on the ground surface or landfill liner, spread into layers, and compacted by heavy. equipment. Successive layers are built up until a depth of 10 to 12 feet is reached. At the end of each day's operations, an intermediate soil cover is spread over the top and sides of the compacted waste. The cover material may be imported or may be excess material from other parts of the landfill. In the trench method, successive parallel trenches are excavated and filled. Soil from the excavation is used for cover material and as windbreaks. The ramp method is typically used on sloping land. The waste is spread and compacted as in the area methods, with the cover material being obtained directly in front of the working face of the filling operation (ARB, 1990).

For all three methods there is a basic landfill cell. After compaction, daily cover material is applied to the cells. In good practice, a 6-inch soil cover is placed over newly received waste at the end of the day. Intermediate covers consist of one-foot of thick, compacted earthen material which is placed on all surfaces of the fill. After this intermediate cover is placed, there is an 180-day period where no additional solid waste is allowed to be deposited in order to control vectors (e.g. flies, rodents, etc.), fires, odors, blowing litter, and scavenging. Afterwards, a final cover is placed on top of the intermediate cover with physical dimensions that should not be steeper than a horizontal to vertical ratio of one and three quarters to one, with a minimum of one 15-foot wide bench for every 50 feet of vertical height. The requirements for daily, intermediate, and final covers can be found in Title 27, Division 2, §20700 - §21090(a)(1).

Biofiltration and Biocovers. Biofiltration or biocovers (or compost) can be used on older, closed MSW landfills. Natural methane oxidation has been shown to occur in landfill cover materials thereby reducing emissions, and it may be possible to enhance such oxidation through use of compost in cover soils.

. Biofiltration uses bacteria to metabolize and remove organic and odorous vapor phase . pollutants from gas streams at composting facilities, sewage plants, and similar operations. Landfills provide advantages for biofiltration operations due to their irturiense internal surface areas, close proximity to most LFG fuel electricity generation, and low incremental costs. In addition, biofiltration beds do not generate secondary gaseous pollutants such as NOx and oxides of sulfur (SOx), unlike combustion based mitigation measures. Emissions are limited to CO_2 and water vapor emissions. Challenges to using biofiltration is the lack of active gas control and monitoring capabilities, as well as the large biofiltration bed sizes required to treat air/LFG mixtures (URS, 2008).

Biocovers are final covers that enhance methane oxidation into C02 before venting to the atmosphere. The biocovers are typically composed of a gas dispersion layer situated below a methane oxidation layer. The gas dispersion layer is a permeable layer of gravel, broken glass, or sand that helps evenly distribute the fugitive LFG to the methane oxidation layer, and to remove excess moisture. The methane oxidation layer is typically made of soil or compost which converts the methane into CO_2 (URS, 2008).

The use of biocovers or biofiltration to reduce landfill gas emissions is still being researched and can not be considered as an alternative means of compliance at this time.

2. Disposal Options

There are five main options for the management of MSW: source.reduction, recycling, composting, municipal waste combustion, and landfilling. Source reduction, or the elimination of waste before it is generated, is important due to: dwindling natural resources, the potential toxic hazards posed by some waste materials, and the growing shortage of disposal capacity. Recycling is the practice of recovering used materials from the waste stream and then incorporating those same materials into manufacturing .processes. Based on CIWMB's 2004 statewide profile, paper,glass, and metals, which together account for almost 43 percent of the MSW stream can easily be recycled (CIWMB, 2004). Composting is the controlled biological decomposition of yard waste which can also achieve significant volume reductions. By utilizing available recycling and composting alternatives the volume and toxicity of waste going to landfills should be reduced. Municipal waste combustion is the high temperature burning of biosolids using a fuel supply such as natural gas or diesel fuel. Currently, there are only three municipal waste combustion facilities in California. The last approach is landfitling where MSW is buried in specially designed disposal sites.

In 2005, approximately 88 million tons of MSW were generated statewide, with about 46 million tons being diverted due to source reductions, recycling, and composting. The remaining 42 million tons were disposed in landfills (CIWMB, 2009). This 2005 diversion figure exceeds the 50 percent waste diversion threshold required by Assembly Bill 939, the Integrated Waste Management Act. AB 939 required jurisdictions to meet diversion goals of 25 percent by 1995 and 50 percent by the year 2000.

C. Methane Generation

1. Landfill Gas Composition

Biological decomposition of organic waste contained in MSW landfills leads to the production of landfill gas, consisting primarily of about 50 percentmethane, 50 percent CO_2, and trace amounts (less than 1 percent) of NMOCs. Methane is a combustible and explosive gas in air having a lower explosive limit of 5 percent methane and an upper explosive limit of 15 percent methane. The heat content of landfill gas is approximately 500 British thermal units per cubic feet (Btu/ft^3) - compared to natural gas which has a heat content of about 1,000 Btu/ft^3 - and consists almost entirely of methane. Methane has a short atmospheric lifetime of about 10 years and changes in methane sources can affect atmospheric concentrations in a relatively short time scale (SCS, 2007a).

NMOCs can be precursors to ozone formation. Some of these compounds are toxic air contaminants and some are highly odorous compounds. NMOCs may be incorporated into the landfill gas through vaporization, chemical reaction, and biological decomposition. Vaporization is affected by the concentration of compounds in the landfill, the physical properties of the individual organic constituents, and the landfill conditions. Odorous NMOCs include alcohols, esters, and mercaptans.

2. Landfill Gas Generation

Landfill gas is produced via aerobic and anaerobic decomposition processes. The aerobic process lasts several days to weeks. In the first phase, oxygen is present at the time waste is placed and CO_2 is the primary gas produced. The second phase, the anaerobic phase, begins once all of the oxygen has been depleted. In this phase, acid-forming bacteria break down complex organic molecules into simpler organic acids. The third phase involves methane production, and a decrease in CO_2 production. In the fourth and final phase, the gas generation reaches a relatively steady state condition. This final phase can last 15 to 60 years. At this point, the gas is typically 25 to 60 percent methane and 40 to 75 percent CO_2, with trace amounts of other gases.

Gas generation rates can vary from site-to-site and are dependent on several factors, such as: the amount of moisture present, quantity and composition of the waste (Le., degradable fraction of waste), age of the waste, the landfill's temperature, pH, and alkalinity, and quality of nutrients. A lack of moisture, which is typical of many California

landfills, leads to a slower gas generation rate and also extends the time during which a landfill actively generates gas.

3. Landfill Gas Movement

Landfill gas moves due to molecular diffusion, compaction and settling, barometric pressure changes, water table f1yctuations, and internal pressure differentials. If uncontrolled, or inadequately controlled, landfill gas can migrate laterally underground and eventually make its way to the surface where it can present an odor or air quality problem. In addition, fires and explosions may result from the accumulation of the landfill gas in basements and crawl spaces of structures on and around MSW landfills.

D. Controlling Methane Emissions

1. Landfill Gas Collection Systems

Landfill gas collection systems can either be active or passive and are specially designed to mitigate underground gas migration and surface emissions.

Active Systems. Active systems use mechanical blowers or compressors to create a pressure gradient (or vacuum) in order to extract the landfill gas. Active collection systems have three main components: gas extraction wells and/or trenches, gas moving equipment, and gas disposal/treatment equipment. Vertical extraction wells consist of 4- to a-inch pipe casings set in 24- to 36-inch boreholes. These wells are typically installed in areas where filling operations have been completed. Horizontal trenches are installed within a landfill as each layer of waste is applied. This method is most suitable for new or expanding landfills. The collected landfill gas is then sent through a header system by a blower or compressor. Design elements depend on the total gas flow rate, total system pressure drop, and vacuum requirements. The collected gas is generally directed to a control device, such as a flare, or energy recovery equipment, such as a boiler, gas turbine, or internal combustion engine. However, it can also be directed to a carbon adsorption system for pretreatment where NMOCs are stripped from the gas and then vented jnto the atmosphere. For the purposes of this proposed regulation, carbon adsorption systems are not considered to be appropriate gas control systems since they do not reduce methane emissions.

Passive Systems. Passive systems are used to control offsite underground gas migration and can be installed on both active and closed landfills. These systems consist of cutoff trenches or vents that penetrate the landfill cover, allowing gases to flow into the atmosphere as pressure within the landfill increases. Passive systems rely on natural pressure or concentration gradients as a driving force for gas flow and thus have much lower collection efficiencies than'active systems. Since these systems do not actively collect, process, or treat landfill gas, but allow methane to be freely vented into the atmosphere, they are not considered to be appropriate gas collection systems for the purpose of the proposed regulation.

2. Landfill Gas Collection Efficiency

Landfill gas collection efficiency is highly dependent on how well the gas collection system is designed and operated and therefore is difficult to quantify. U.S. EPA uses a default value of 75 percent; however, some landfill owners and operators claim rates of up to and above 95 percent, while environmental organizations believe these rates are much lower, about 20 to 40 percent (see Chapter VIII for a summary of research efforts on collection efficiency uncertainty). A properly designed and operated system should include gas moving equipment capable of handling the expected landfill gas generation flowrate, collection wells and trenches configured such that the landfill gas is effectively collected from all areas of the landfill, and design provisions for monitoring and adjusting the operation of individual extraction wells and trenches.

The efficiency of a collection system depends on the proper location of wells and trenches. To effectively control emissions from all areas of a landfill, the areas in which the wells or trenches exert a negative pressure (also known as the "zone of influence") should overlap. The zone of influence determines the spacing between extraction wells or the location of trenches. The zone of influence depends on the landfill depth, magnitude of the pressure gradient applied by the blower or compressor, waste type, waste compaction, and gas moisture content. Each extraction well should have a throttling valve and pressure gauge to adjust and monitor the collection system. Extraction wells are typically placed in an equilateral triangle arrangement to maximize their collection efficiency, and are installed in areas where filling operations have been completed. Horizontal extraction trenches can be applied in each landfill cell as each layer of waste is added. Loose-jointed pipes are connected through laterals to a collection header. However, these are most suitable for new or expanding landfills because they can easily draw in air from the surface until a significant height of refuse and cover is placed over them.

3. Optimizing Gas Collection Efficiency

Optimizing gas collection efficiency is dependent on landfill design, operation and maintenance of the gas collection system, and closure/post-closure practices.

Landfill Design. Operation. and Maintenance. A 2007 CIWMB study reported that common practice among landfill operators in collecting their landfill gas is to wait until a landfill cell is completed prior to installing vertical wells using standard design for the well placement and spacing (SCS, 2007b). This practice results in adequate gas collection from the landfill. However, to enhance landfill gas recovery at MSW landfills, the study suggests several design and operations-related best management practices (BMPs), such as: the use of horizontal or surface collectors; tighter spacing of landfill gas wells, mixed horizontal and vertical well systems, connection of the leachate collection and removal system to the gas collection system, deep multi-depth vertical wells, enhancing seals on landfill gas wells and boreholes, promotion of deeper landfills, limiting delays on the installation of final cover systems, and earlier installation of the gas collection system. A description of these BMPs is provided in Table 111-2.

Table 11l-2..Design and Operations-Related Best Management Practices

Best Management Practice	Description
Horizontal or Surface Collectors	Horizontal collectors collect landfill gas before vertical welis are installed. Surface collectors collect gas from a landfill where traditional wells fail due to water infiltration.
Tighter Spacing of Landfill Gas Wells	Vertical wells are closely spaced to increase the overlap of the zone of influence.
Mixed Horizontal and Vertical Well Systems	Horizontal collectors are installed in active areas while vertical wells are placed where they' are not at risk of damage from operations.
Connection of the Leachate Collection Removal System (LCRS) to Landfill Gas System	LCRS is connected to the landfill gas recovery system to collect gas along the bottom of the landfill.
Deep Multi-depth Vertical Wells	Wel!s place at multiple depths in the same boring at higher vacuum. Also, wells can alternate between shallow and deep.
Enhance Seals on Landfill Gas Wells and Boreholes	Improved seals allow more vacuum to be applied to landfill gas wells.
Promote Deeper Landfills	Deeper landfills are allowed without requiring a larger footprint.
Limiting Delavs on Final Cover Systems	Final cover is applied to landfills sooner.
Earlier Installation of the Gas Collection System	Landfill gas systems are installed earlier than currently required by regulation.

Source. SCS, 2008

Gas collection and control systems should be operated and maintained to minimize the escape of landfill gas into the environment. To effectively operate an active landfill gas collection system, gas moving equipment capable of handling the expected landfill gas generation flow rate is required, along with collection wells and trenches configured so that landfill gas. is effectively collected from all areas of the landfill. Monitoring and adjustment is also needed for the proper operation of these wells and trenches. Collection header pipes should be sized to minimize pressure drop. And, each extraction well has a zone of influence in which it can effectively collect landfill gas. Placement of wells should be designed with this in mind.

Quarterly surface emission testing is typically used to evaluate the effectiveness of the gas collection system and to check for surface emissions. The testing is conducted using a hydrocarbon detector or other equivalent device to monitor methane concentrations within three inches of the landfill surface. All areas are monitored except steep slopes and other areas which may pose a hazard to the inspector or technician. All breaks between the cover and the waste and native soil interface are also checked. Repeated exceedances of established surface emission standards may be an indicator of insufficient vacuum on gas wells or the need to expand the gas collection system.

Areas where the surface of the landfill has been penetrated (e.g., around landfill well casings and bore holes) can be a significant source of surface gas leaks and air

intrusion due to cracking around the point of penetration. Wellboots and geomembranes composed of an impermeable substance such as polyvinyl chloride (PVC) are successful in minimizing leakage in many cases. Geomembranes prevent gas leaks through the use of plastic covers several centimeters thick that cover the top of the landfill surface and surrounds the bore holes drilled to collect methane gas. Wellboots consist of flexible skirts typically made of plastic that covers the lower section of the well bore pipes and connects to the geomembrane to prevent leakage from the gaps between the bore and geomembrane. The impenetrable barrier allows landfill operators to maximize emissions mitigation through the use of higher vacuum pressures at the well head to extract the landfill gas. Furthermore, geomembranes are flexible covers and can be installed in a collapsed position to accommodate future settlement around the well casing. As settlement occurs due to waste refuse decomposition and compaction, the initially collapsed boot elongates. The boot can then be readjusted to a new collapsed position before the membrane reaches its elastic limit (Landtec, 2004).

Closure/Post-Closure Practices. Closure is the process during which a landfill, or a portion thereof, is no longer receiving waste and is being prepared for post-closure maintenance according to an approved plan. When a landfill is closed, it has ceased accepting waste. Landfill owners and operators are required by CIWMB to submit closure/post-closure maintenance plans to ensure that the closure/post-closure maintenance and the eventual reuse of their landfills will conform to State performance standards and requirements. The landfill owner or operator must also provide demonstrations of financial responsibility for both closure and post-closure maintenance.

Closure and post-closure practices, such as the type of final cover used on landfills cells, are important factors in optimizing gas collection efficiency. The permeability of a landfill's final cover affects the efficiency of gas extraction, the amount of moisture in the cell, and consequently the flow of landfill gas in the cell (URS, 2008). If a landfill has a more permeable cover, it may allow higher occurrences of surface emissions or air intrusion into the landfill. In comparison, highly impermeable covers will greatly reduce the entrance of moisture into the landfill cell and slow the degradation process. The ideal situation for enhanced waste decomposition at a landfill is using a low permeability cover in combination with highly permeable materials that surround the perforated gas collection wells and trenches (URS, 2008).

Examples of landfill cover materials used to enhance gas collection efficiency include soil, compacted clay, geomembranes, and biocovers. Excluding biocovers, geomembranes provide the highest methane collection (URS, 2008). Final covers consist of a foundation layer made from soil or other approved materials and must be more than two feet.thJck. The foundation layer is followed with a low impact hydraulic conductivity layer to prevent water entry, leachate production, and gas migration. The hydraulic layer is finally covered by an erosion resistant layer that is either vegetative or mechanical. Vegetative layers are typically made of more than one foot of soil that could sustain plant growth. Mechanical layers are comprised of ultraviolet light resistant materials such as asphalt, cem,ent; and soil sealants (Title 27, Chapter 3, §20950).

4. Landfill Gas Control Systems

a. Flares

Flares are either open (also referred to as "candlestick" or "elevated" flares) or enclosed (also referred to as "ground-type" flares). These control devices destroy landfill gas via combustion. Methane is converted to CO_2, resulting in a large greenhouse gas reduction (ATSDR, 2001). Flares can be the primary method of methane control at a landfill or a back up for emergencies or when other control devices undergo repair or maintenance. The main components of these devices are a gas burner, stack, water seal/liquid trap, flame arrestors, air and combustion controls, temperature sensor, pilot burner, and an ignition system. Flare manufacturers typically include parameters that ensure proper gas stream contact with the flame, turbulent mixing of the air and fuel, and flame retention time. Flares may be used when gas production is not sufficient to economically support either energy recovery systems or purification techniques.

Open Flares. Open flares are inexpensive in comparison to enclosed flares and represent the simplest flaring technology. They consist of a pipe through which the gas is pumped, a pilot light to ignite the gas, and a means to regulate the gas flow. However, since they are essentially an exposed flame they cannot be easily be sampled for compliance testing. It is not feasible to source test or measure the percent reduction of methane concentration for open flares. Open flares also emit more luminosity, noise, and heat radiation compared to enclosed flares.

Enclosed Flares. Enclosed flares are more expensive and complex than open flares. They consist of multiple gas burners enclosed within fire resistant walls that extend above the flame. The multiple gas burners are grouped and staged to operate at wide ranges of flow rates. The enclosure reduces luminosity, noise, and heat radiation problems and allows the flare to be located at ground level. Unlike open flares, the amount of gas and air entering can be controlled making combustion more reliable and efficient. The intake of air is automatically adjusted by the opening and closing of dampers at the bottom of the shell, which are regulated by the combustion temperature. As combustion efficiency increases, in general so does the concentration of NOx. Enclosed flares can be easily source tested to measure flare destruction and treatment efficiency. Based on ARB staff's review of source tests results, enclosed flares can achieve destruction efficiencies for methane of 99 percent or greater.

b. Energy Recovery Systems

Internal Combustion Engines. Internal combustion engines (IC engines) are the most commonly used energy-recovery technology for landfill gas applications. IC engines have significant energy conservation benefits in comparison to flares. They are widely used because of their low cost and high efficiency (ARB, 1998). They also have a short construction time, are easy to install, and can operate over a wide range of speeds and loads. They have 25 to 30 percent efficiency for power generation when operating on landfill gas (ARB, 1998).

The air to fuel ratio has a major effect on the combustion efficiency of the IC engine. When 'combustion efficiency decreases, the emissions of VOCs and CO increase. Also, NOx forms due to high pressures and temperatures during the combustion process. Issues may arise with environmental permitting since these engines have relatively high NOx emissions. Other primary emissions from IC engines include CO, PM, and VOCs. Rich-burn internal combustion engines can typically achieve destruction efficiencies for methane of at least 99 percent, in comparison to lean-burn engines which have destruction efficiencies for methane ranging from 87 to 95 percent.

Gas Turbines. Gas turbines can be used to drive pumps, compressors, or electrical generators. There are two types of generators used: simple cycle and regenerative cycle. Simple cycle turbines combust fuel in one or more compressor stages and combustion chambers, and this combusted fuel turns on one or more turbines. The turbine is started with an electric motor, diesel engine, or other energy source to rotate a compressor that provides compressed air to the combustors. Fuel is introduced into the combustors and burned to produce hot gases that rotate the turbine fan and shaft. A regenerative cycle gas turbine differs from a simple cycle turbine in that it has an added heat exchanger. The regenerative cycle turbine is more efficient than the simple cycle because it recovers thermal energy from the hot exhaust gases, and uses this to preheat the compressed inlet air, which means less fuel is required to heat the compressed air. Gas turbines emit NOx, CO, PM, and VOCs (ARB, 1998). The peak temperature of the flame in the destruction zone has the largest effect on VOC destruction efficiency. As the peak flame temperature decreases, VOC and CO emissions increase. Also, NOx emissions increase with an increasing peak flame temperature and increasing pressure ratios. Gas turbines can achieve destruction efficiencies for methane of 99 percent or higher.

Boilers. Boilers are used as a simple source of heat and hot water and to generate steam. The usable steam produced can either be used on-site at the landfill or off-site. Steam produced by the boiler can also be used to power a turbine generator set and produce electricity. The boiler/steam turbine combination Illixes a conventional boiler, usually a packaged unit, and a steam turbine generator that produces electricity. The majority of landfill gas-fired boilers are of the industrial type with heat inputs of about 10 million Btu/hr and 90 million·Btu/hr. Boilers emit PM, SOx, NOx, and smaller amounts of CO and VOCs (ARB, 1998). Increases in flame temperature, oxygen availability, and/or residence time at high temperature leads to an increase in NOx production. The rate of CO emissions from boilers is dependent on combustion efficiency. Boilers are the least used technology for landfill gas recovery systems and are applicable mainly for larger projects. Boilers can achieve destruction efficiencies for methane of at least 99 percent.

Microturbines. Microturbines are suitable for smaller landfills with lower gas flow rates. However, the use of this technology requires the landfill gas to be pretreated to remove impurities. Microturbines are more expensive than IC engines. Microturbines are derived from turbocharger technologies found either in large trucks or the turbines of aircraft auxiliary power units. Many of these engines are still undergoing field tests or

are part of large-scale demonstrations, but have almost reached commercial status at this point. There are two general classes of microturbines: recuperated and unrecuperated. Recuperated microturbines recover heat from the exhaust gas in order to boost the temperature of combustion and increase its efficiency. Unrecuperated microturbines have lower efficiencies but they also have lower capital costs. Microturbines produce 25 to 500 kilowatts of power and emit a relatively low level of NOx (BAAQMD, 2007). Microturbines can achieve destruction efficiencies for methane of 99 percent or higher.

Fuel Cells. The phosphoric acid fuel cell is a non-combustion technology that can be used with landfill gas to produce energy. Other types of fuel cells (molten carbonate, solid oxide, and solid polymer) are still in varying stages of development and have not yet been demonstrated with landfill gas (ARB, 1998). All fuel cells use hydrogen gas as a primary fuel source to produce electricity. Landfill gas is a potential source of hydrogen gas. Fuel cells are a potentially attractive option for controlling landfill gas because of their high electrical conversion levels, suitability to both small and large landfills, low labor and maintenance requirements, minimal noise impact, and extremely low air emissions. The major drawback for using fuel cells is that they are expensive and the landfill gas must first go through pretreatment to remove impurities, such as water, undesirable VOCs, and CO_2 (ARB, 1998).

c. Other Treatment Options

Compressed and Liquefied Natural Gas Motor Vehicle Fuel. Compressed natural gas (CNG) can be used for motor vehicle fuel. The main steps involved in processing landfill gas into CNG are water removal, pretreatment to remove trace organics, membrane technology to separate CO_2, and final compression to about 3,600 pounds per square inch. Compressed landfill gas has essentially the same qualities and properties as CNG, once it has been processed to remove contaminants. Using compressed landfill gas as an alternative fuel for motor vehicles has been used commercially for several years now. The Los Angeles County Sanitation Districts have been successfully using compressed landfill gas as a vehicle fuel since 1994. Production of liquefied natural gas (LNG) from landfill gas is more challenging and requires additional steps in the form of purification and cryogenic systems. Currently, California does not have any commercial plants in operation for producing LNG;

The primary emission reduction benefits from using landfill gas as a vehicle fuel come from displacing the fossil fuels uses for vehicle fuel. Additional emission reduction benefits occur when landfill gas is used as a vehicle fuel instead of being flared. However, converting landfill gas to a vehicle fuel produces small quantities of NOx, carbon monoxide (CO), VOCs, and PM.

Landfill Gas to Pipeline Qualitv Methane. Raw landfill gas can be upgraded to pipeline quality natural gas if it is pretreated to remove contaminants such as water, VOCs, and CO_2. The gas must also be dehydrated and the VOCs collected before removal of CO_2 can begin. Pretreatment techniques include physical absorption, adsorption onto a

solid, and molecular diffusion membrane separation. After treatment, the resulting gas stream typically consists of approximately 55 percent methane, 45 percent C02, up to 5 percent nitrogen, and 1 percent CO_2. Using compressed landfill gas as a vehicle fuel maybe particularly viable for landfills that are not close to an electric grid or gas pipeline.

E. Emerging Technologies for Monitoring and Evaluating Collection Efficiency

1. Optical Remote Sensing and Radial Plume Mapping

Some stakeholders recommended using optical remote sensing (ORS) and radial plume mapping (RPM) in lieu of surface emissions monitoring. U.S. EPA is evaluating a method for measuring landfill gas emissions using these technologies. ORS involves placing laser emitters and sensors at opposite corners of the landfill. RPM is a one-dimensional methodology designed to map pollutant concentrations in either a horizontal or vertical plane. ARB staff believes that this technology is limited to flat topographies, low wind speeds, and is weather sensitive. The test method also requires sigriificant ambient light and the equipment cannot be operated unattended. The technology is very expensive: approximately $450,000 in capital investment and another $100,000 for one week staff time and on-going training is required for staff due to the frequent updating of the computer software.

2. Gas Tracers

Stakeholders submitted comments that gas tracers are a more accurate way of quantifying capture efficiency of gas collection systems. Methane gas emissions have been challenging to measure due to the high variability in the reported methane emissions data. Traditional methods of measuring collection efficiencies based on recovery or production methods is expensive since data is needed from the entire landfill and may not be able to assess the efficiency of gas collection from different regions of the same landfill. Tracer gases on the other hand can potentially track the efficiency of an existing collection system as a landfill cell moves from active to intermediate to final cover, or to evaluate various operational changes on the collection efficiency of one well or a system of wells.

Tracer gases (e.g., sulfur hexafluoride,helium or difllluromethane) are injected into a particular location within a landfill which is then followed by continuous sampling of gas in nearby gas collection wells until the monitored tracer gases reach a certain concentration. By knowing the mass of tracer injected, the measured breakthrough curve, and the gas flow rate from the extraction well, the fraction of tracer mass collected in the gas collection well can be determined (Imhoff, 2008).

IV. EMISSIONS

This chapter discusses the development of ARB's landfill emissions inventory, number of potentially affected MSW landfills, and methane emission reduction estimates.

A. Emissions Inventory

1. Sources

In California, MSW landfills are the second largest anthropogenic source of methane (ARB,2009b). CIMWB provided data on 372 landfills known to contain waste that is biodegradable at least in part and have the ability to generate methane emissions. This information was used to develop ARB's landfill inventory. Landfills containing only inert waste, like ash and masonry from demolition sites, were excluded. The landfill inventory also excludes approximately 1,500 closed, illegal, or abandoned disposal sites, including burn dumps and other types of sites that are not likely to generate landfill gas. The landfill inventory was used to develop requirements for MSW landfills that considered the landfill's size, age, methane generation flow rate (or landfill gas heat input capacity), and the ability to support the continuous operation of a gas control device without the use of supplemental fuel.

The total number of landfills in ARB's inventory is a count of each landfill's Solid Waste Information System identification numbers (SWIS ID), which is issued by CIWMB. However, a few landfills were assigned multiple SWIS ID numbers because they were separated into individual waste units. Since the emissions were estimated for each landfill as a whole and not for individual waste units, the landfills are counted by facility site name instead of by their SWIS identification numbers for the purpose of this chapter. This makes the total number of landfills currently in the inventory 367 opposed to 372.

Table IV-1 provides a breakdown of the number of potentially affected landfills and their emissions. Of the 367 landfills, 218 received solid waste after January 1, 1977, and are potentially affected by the proposed regulation. This includes landfills that may be subject to control requirements in the future from the baseline year 2009 up to and including 2020. Out of the 218 landfills: 72 landfills would be subject to only reporting requirements because they are below the landfill size threshold of 450,000 tons of waste-in-place and the landfill gas heat input capacity of 3.0 MMBtu/hr; 132 landfills already have gas collection and control systems installed; and 14 are currently uncontrolled but may be required to install controls based on their size and estimated landfill gas heat input capacities. The 14 landfills include those having carbon adsorption or passive venting systems, which are not considered controls with respect to methane.

Table IV-1. Potentially Affected MSW Landfills

Category	Number of Landfills
Total number of landfills	367
Landfills potentially affected by the proposed r-egulation	218
Landfills subject to reporting requirements only	72
Landfills already having gas collection and control systems	132
Landfills which may be required to install new gas collection and control systems	14

Table IV-2 provides the number of MSW landfills by local air district that may be required to install gas collection and control systems. The majority of these landfills are currently active; however, by 2015 about half of these landfills will be closed and no longer accepting waste. Out of the 14 MSW landfills, 10 are public; three are private; one is operated by the military; 11 have no form of emission control, two have carbon adsorption systems, and one has a passive venting system. The estimated landfill gas (LFG) heat input capacities of the 14 landfills are all above 3.0 MMBtu/hr by 2020, except for one landfill which is expected to have a Btu value of 2.9 MMBtu/hr by 2012 and 2.2 MMBtu/hr by 2020. For this one landfill, the 2012 and 2020 values may be insufficient to support the continuous operation of a flare without the use of supplemental fuel. In this particular case, the installation of a gas collection and control system may not be justified (the landfill would need to conduct a more detailed analysis).

Table IV-2. MSW Landfills Potentially Required to Install Gas Collection and Control Systems

Local Air District	Number of Landfills	Closure Year	2006 Waste-in-Place (MMT)	"Current" 2010 Control Type	Status	Estimated 2010 LFG Heat Input Capacity (MMBtu/hr)	Estimated 2020 LFG Heat Input Capacity (MMBtu/hr)
Bav Area	1	2020	0.8	None	Private	5.4	6.9
Calaveras	1	2032	0.6	None	Public	2.7	4.3
Glenn	1	2021	0.8	None	Public	3.0	3.4
Imperial	1	2010	2.0	None	Private	8.5	14
Lake	1	2027	1.0	None	Public	6.7	8.1
Mendocino	1	2001	0.8	Passive Venting	Public	3.2	2.2
Mojave	1	2007	1.6	None	Public	6.1	8.2
Moiave	1	2013	0.9	None	Public	4.3	6.9
Sacramento	1	2013	3.6	Carbon Adsorption	Private	15	23
San Diego	1	2184	0.8	None	Military	3.4	4.3
San Joaquin	1	2009	1.0	None	Public	4.6	6.3
San Joaquin	1	2020	1.1	None	Public	5.6	12
San Joaquin	1	2043	4.0	Carbon Adsorption	Public	17	23
Shasta	1	2013	2.1	None	Public	15	21

3. Methodology

CIWMB provided data to ARB to assist in the development of the landfill inventory. In addition, ARB staff requested site-specific landfill gas collection data from MSW landfill owners and operators through landfill surveys, but received answers for only certain years and for less than half of the landfilled waste (approximately 42 percent in 2005). Therefore, ARB staff opted to use a model to estimate landfill emissions for all sites, and used the survey data to supplement the model estimates where appropriate.

ARB staff used the Mathematically Exact First-Order Decay model from the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines (IPCC, 2006b). This model assumes that a fixed fraction of the waste available will degrade at any moment. The amount that degrades over a given amount of time is determined by a factor *(k),* which is tied to the moisture content in the landfill. The *k* ,values used in the model were obtained from U.S. EPA and are a function of the annual precipitation occurring at each landfill; rainfall being used as a surrogate for landfill·moisture content. The model assumes that the carbon in the landfil,led waste is biodegraded into equal amounts of CO_2 and methane (see Appendix C).

The IPCC emission model equations and default values used to determine the landfill gas heat input capacity are incorporated into the proposed regulation. A landfill gas tool is being developed by ARB staff to assist landfill owners and operators in doing the calculations. U.S. EPA's Landfill Gas Emissions Model (LandGEM) Version 3.02 was not used because IPCC is now available and is being used in several countries and is the most recent model for estimating emissions from. landfills. The landfill emissions inventory is based on IPCC's methodology. The main advantages of the IPCC model is that it allows the user to: adjust the potential-methane generation capacity on a year-to-year basis; use specific degradation parameters by waste type; use time delays other than six months; and correct for methane oxidation. The primary drawback of LandGEM is its inability to allow for potential methane generation capacity variation on a year-to-year basis over the lifetime of the landfill, which is very important to the results. A more detailed discussion of the methodology used to develop the landfill inventory is provided in Appendix C.

B. Emissions and Emission Reductions

1. Emissions

ARB staff estimated methane emissions from the 367 MSW landfills in the inventory. Based on 2006 data, GHG emissions from MSW landfills were estimated to be about 6.3 $MMTC0_2E$ in 1990. In 2000 the GHG emission level dropped to 5.9 $MMTC0_2E$. During this time period, several landfill gas control measures were adopted (e.g., ARB's suggested control measure for landfill gas emissions, local air district landfill gas rules, the federal NSPS and EG, and the federal NESHAP) to reduce landfill gas emissions. Although these measures targeted primarily NMOCs and VOCs, it also had the added benefit of reducing GHG emissions such as methane. However, due to population

growth and increased waste disposal, without additional regulation, GHG emissions are forecasted to increase to approximately 7.7 MMTC02Ein 2020.

2. Landfill.Gas **Collection Efficiency Measurement Study**

There are uncertainties concerning methane collection efficiencies. Collection efficiency is a measure of the ratio of methane captured by the control system plus the amount naturally oxidized to the total methane generated. The effectiveness of an active I.andfiil gas coliection system depends greatly on the design and operation of the system and is difficult to quantify. U.S. EPA's *Compilation of Air Pollutant Emission Factors* (AP-42) assumes a range from 60 to 85 percent, with 75 percent as "typical" for sites having a well-designed active collection control system in place. ARB staff used this default value in calculations to initially estimate methane emissions from MSW landfills. Some stakeholders are concerned that the actual capture efficiencies are significantly lower than the default value because gas generation starts before control systems are in place, although such generation may be relatively low. Other stakeholders believe actual capture efficiencies are significantly higher especially for landfills in California where relatively arid conditions occur, and where very stringent emissions control standards have been in place since 1990. Recent direct measurement studies of landfills by the Los Angeles County Sanitation Districts conclude very high capture efficiencies of above 95 percent are being achieved (CIWMB, 2007b).

ARB staff evaluated a study conducted by the Los Angeles County Sanitation Districts (LACSD) in the 1990's for measuring landfill gas collection efficiency at the Palos Verdes landfill. This study is the first of two such studies which examined this issue. LACSD developed a methodology for measuring gas collection efficiency based on a combination of readily acquired integrated surface methane concentration data and modeling using the U.S. EPA Industrial Source Complex (ISC) air dispersion model (Hutric, 2007). The methodology was applied to estimate landfill gas collection efficiency at a LACSD landfill and indicated an efficiency approaching 95 percent (Hutric, 2007). However, the results of ARB staffs evaluation of the LACSD study using U.S. EPA's latest air dispersion model AERMOD, which replaced ISC, demonstrated a collection efficiency of about 85 percent for the gas collection system at the Palos Verdes landfill. Further discussion on ARB staffs review of the LASCO study is provided in AppendiX D.

The Palos Verdes landfill is subject to SCAQMD Rule 1150.1 which contains surface emissions monitoring requirements that are more stringent than existing federal requirements for MSW landfills and are similar in stringency to the proposed regulation. Accordingly, ARB staff believes that MSW landfills that are subject to the proposed regulation can achieve a gas collection efficiency of at least 85 percent, which is used for estimating the emission reductions.

3. Methane Emissions Reductions

ARB staff identified 14 currently uncontrolled MSW landfills that may generate sufficient gas to support the installation of gas collection and control systems. Based on the latest ARB 2020 forecast of landfill emissions, if all 14 of these landfills with 450,000 tons of waste-in-place or more were to install emission controls for methane, emissions would be reduced by 0.4 MMTC0_2E in 2020. The statewide implementation and enforcement of this proposed regulation for all affected MSW landfills (including those with gas collections systems already installed) is expected to result in an additional estimated emission reduction of 1.1 MMTC0_2E in 2020. This estimate assumes a collection efficiency of 85 percent resulting from the implementation of ARB's enhanced surface emissions monitoring requirements. The total emission reductions resulting from the implementation of the proposed regulation are expected to be 1.5 MMTC0_2E in 2020. Table IV-3 summarizes the emission reduction estimates.

Table IV-3. Estimated Methane Emission Reductions

Category	Number of Landfills	Methane Emission Reductions (MMTC0_2E [1])		
		2011	2015	2020
Landfills with existing controls[2]	92	0.9	1.0	1.1
Landfills potentially required to install controls	14	*N/A*	0.4	0.4
Totals	106	0.9	1.4	1.5

1. Assumes an 85 percent collection efficiency.
2. Excludes 40 MSW landfills that are subject to SCAQMD Rule 1150.1.

C. Further Inventory Improvements

A more complete California-specific landfill survey data on landfill gas collection and composition will help improve outputs from the IPCC model. Better information on the cover types present at landfills and further details on gas collection systems will allow for better collection and oxidation factor estimates. Ongoing research and other studies to improve estimates of landfill gas emissions will be followed closely by staff (see Chapter VIII). Additionally, the proposed regulation contains reporting requirements that will be used to further update the landfill inventory.

V. DEVELOPMENT OF THE PROPOSED REGULATION

This chapter summarizes the requirements of the proposed regulation presented in Appendix A of this Staff Report. The proposed regulation reflects comments received at the public workshops and landfill technical review workgroup meetings; comments received based on public review of draft versions of the proposed regulation; and comments received through interagency review. This chapter also discusses alternatives considered during the development of the proposed regulation.

A. Summary of the Proposed Regulation

The proposed regulation will require the installation of gas collection and control systems at active, inactive, and closed MSW landfills having 450,000 tons of waste-in-place or greater and applies to all MSW landfills that received waste after January 1, 1977. An active MSW landfill is one that is currently accepting solid waste for disposal. Inactive landfills are no longer accepting solid waste for disposal and are typically unstaffed, whereas closed landfills still have on-site staff overseeing the operation of the landfill.

The proposed regulation contains performance standards for the gas collection and control system, and specifies monitoring requirements to ensure that the system is being maintained and operated in a manner to minimize methane emissions. The proposed regulation establishes standards for gas collection and control systems including a leak standard for gas collection and control system components, a monitoring requirement for wellheads, methane destruction efficiency requirements for most control devices, and surface methane emission standards. The specific design of the gas collection and control system to meet these requirements is determined by the MSW landfill owner or operator.

1. Applicability (Section 95461)

The proposed regulation applies to all MSW landfills that received solid waste after January 1, 1977. This date excludes approximately 1,500 closed, illegal, or abandoned disposal sites, including burn dumps and other types of sites that are not likely to generate landfill gas in sufficient quantities to be collected and controlled. There are about 367 landfills currently in ARB's landfill emissions inventory that have the potential to generate sufficient methane emissions.

MSW landfills having 450,000 tons of waste-in-place or greater would be required to install active gas collection and control systems and comply with the requirements of the proposed regulation unless exemption conditions are met. The threshold of 450,000 tons of waste-in-place was selected because landfills with less waste-in-place are not expected to generate enough landfill gas to operate a gas collection and control system without supplemental fuel. To determine this threshold, ARB staff considered a flare to represent the most readily available and feasible means of treating landfill gas. Based on discussions with industry representatives, local air district staff, and CIWMB

staff, ARB staff determined that the smallest commercially available flares are capable of processing approximately 133 standard cubic feet per minute of landfill gas (or' 3.0 MMBtu/hr) without the use of supplemental fuel. According to the inventory, this corresponds to landfills with 450,000 tons of waste-in-place or greater and represents a feasible lower limit for the installation of a gas collection and control system at a typical landfill.,

2. Exemptions (Section 95462)

The intentofthe proposed measure.is to minimize methane emissions from·MSW landfills. Therefore, hazardous waste landfills, landfills that receive construction and demolition wastes, and landfills containing only non-decomposable solid waste, which is incapable' of degrading biologically to form landfill gas, are exempt from the requirements of the proposed regulation. However, in some cases, these landfills may be subject to other local, State, and federal requirements.

3. Determination for Installing a Gas Collection and Control System (Section 95463)

MSW Landfills with 450,000 Tons of *Waste-in-Place or Greater*

If a MSW landfill has 450,000 tons of waste-in-place or greater, the owner or operator must first determine if they are required to install a gas collection and control system based on the landfill's gas heat input capacity. The proposed regulation uses a landfill gas input heat capacity threshold of 3.0 MMBtu/hr to determine whether or not a MSW landfill may not be able to sustain an enclosed flare, operating on a continuous basis, without the need for supplemental fuel. If the landfill gas heat input capacity is less than 3.0 MMBtu/hr and the MSW landfill is active, the landfill gas heat input capacity is recalculated annually until it is determined to be either greater than or equal to 3.0 MMBtu/hr or the landfill closes and ceases to accept waste. If the MSW landfill is closed or inactive and the landfill gas heat input capacity is less than 3.0 MMBtu/hr, a gas collection and control system is not required and the requirements of the proposed regulation no longer apply.

If the landfill gas heat input capacity is greater than or equal to 3.0 MMBtu/hr, the owner or operator must either install a gas collection and control system, or demonstrate to the satisfa.ction of the Executive Officer that after four consecutive quarterly monitoring periods there is no leak at any location of the landfill surface that exceeds a methane concentration of 200 ppmv or greater. If the MSW landfill is active and there is no leak exceeding 200 ppmv, the owner or operator must recalculate the landfill gas heat input capacity annually until either the MSW landfill requires a gas collection system or closes and ceases to accept waste. If the MSW landfill is closed or inactive and there is no leak exceeding 200 ppmv, a gas collection and control system is not required and the owner or operator only needs to comply with limited reporting requirements.

MSW Landfills with Less Than 450.000 Tons of *Waste-in-Place*

Active MSW landfills having less than 450,000 tons of waste-in-place are exempt from the substantive requirements of the proposed regulation but the owner or operator must comply with limited reporting requirements. These landfills currently do not generate sufficient gas to support a gas collection and control system. Active MSW landfills must submit a Waste-in-Place Report annually until either the landfill size threshold is exceeded, or the landfill closes. This allows ARB to monitor when these landfills may become of sufficient size to support a gas collection and control system. Appendix B presents a flow chart showing the steps for determining whether the landfill must be controlled. Owners and operators of closed or inactive MSW landfills are exempt from the regulation.

4. Gas Collection and Control System Requirements (Section 95464)

The proposed regulation requires the installation of a properly designed gas collection and control system that minimizes methane emissions and the proper operation of that system. Carbon adsorption and passive systems are not considered to be appropriate systems since they do not reduce methane emissions. The proposed regulation requires a Design Plan to be prepared by a professional engineer registered with the State of California and submitted to the Executive Officer for approval.

The Design Plan details how the design of the collection system will handle the landfill's methane generation potential and maintain negative pressure at all wellheads, and when the collection system must be expanded. This wellhead pressure requirement, in conjunction with the surface methane emissions standards, helps to minimize groundwater impacts by ensuring that methane is routed through the gas collection system to a gas control device. It also specifies the gas control devices that will be used (e.g., an enclosed flare). The Design Plan must be submitted either within one year of the effective date of the proposed regulation, within one year after the determining that the landfill gas heat input capacity is greater than 3.0 MMBtu/hr, or within one year of measuring a leak on the landfill surface that exceeds 200 ppmv.

Any owner or operator of an active landfill subject to the proposed regulation must install an active gas collection and control system within 18 months after approval of the Design Plan. This allows sufficient time to obtain the necessary permits, and to procure and install the system. Closed or inactive MSW landfills, which do not directly generate revenue, are provided an additional 12 months for installation (for a total of 30 months) in order to obtain the necessary funds to comply. The proposed regulation includes a provision for amending the Design Plan to respond to changes in site conditions.

Flares are expected to be the most common control device selected by MSW landfill owners and operators to comply with the proposed regulation. If a flare is used as the control device, it must be an enclosed flare that meets a methane destruction efficiency of 99 percent or higher. Enclosed flares are more reliable (compared to open flares), efficient, and can be easily source tested to measure their destruction efficiency.

Open flares cannot be easily source tested and are not considered to be best available control technology. However, the proposed regulation allows the continued use of the five open flares currently operating in California until January 1, 2018. The continued operation past January 1, 2018, is allowed only if the owner or operator can demonstrate that the gas quality and flow rate is insufficient to support the continuous operation of an enclosed flare. Otherwise, the temporary use of an open flare is permitted only under limited conditions including during the repair or maintenance of the gas control system, or if necessary to remedy a situation where there is gas migrating offsite..

Gas control devices, except for open flares must be source tested annually. If the gas control device remains in compliance after three consecutive annual source tests, it may be tested every three years. Any subsequent tests showing that the control device is out of compliance will return the source testing frequency to annual.

The proposed regulation requires other gas control devices, such as gas turbines, boilers, and rich-burn engines, to meet a methane destruction efficiency of 99 percent or higher: However, lean-burn engines are allowed although they are only capable of achieving a methane destruction efficiency ranging from 87 to 95 percent. There are several older lean-burn engines currently operating in California, which are used for energy recovery. Requiring these engines to shut-down would result in a reduction of electrical generation capacity in the state. Based on the review of source test data, ARB staff determined that most lean-burn engines are able to meet a 3,000 ppmv outlet methane concentration limit (dry basis, corrected to 15 percent oxygen), which is acceptable for the purposes of the proposed regulation. This alternative standard ensures that the proposed regulation will not unnecessarily affect the State's electrical supply.

Landfill gas may also be routed to a treatment system that processes the collected gas for subsequent sale or use, or injected into the natural gas pipeline. However, all emissions that are vented to the atmosphere from an on-site gas treatment system must be routed to a control device, such as an enclosed flare.

5. Surface Methane Emission Standards (Section 95465)

The proposed regulation establishes a 500 ppmv instantaneous surface monItoring standard and a 25 ppmv integrated surface monitoring standard to ensure that the gas collection system is adequately controlling emissions. Instantaneous monitoring is used to identify fugitive emissions from cracks or fissures in the landfill surface. Integrated monitoring is a good indicator of how well the gas collection system is operating overall. Any difficulties in meeting an integrated monitoring standard would be an indicator of problems with the collection system.

A 500 ppmv instantaneous standard is present in federal and local air district regulations for non-methane organic compounds. ARB staff believes that this is an appropriate and attainable standard for methane. The integrated standard is modeled

after South Coast Air Quality Management District (SCAQMD) Rule 1150.1. Although the SCAQMD rule requires an integrated surface standard of 50 ppmv (for non-methane organic compounds), ARB staff reviewed historical compliance data which indicated that very few landfills would not be able to meet a 25 ppmvintegrated surface methane standard using current operating practices. Given that that these standards will be new for many California landfills and more stringent for some, the proposed regulation begins implementation on January 1, 2011. ARB staff believes this effective date allows sufficient time for landfill owners and operat.ors to make the necessary system adjustments and improvements, establish monitoring protocols and procedures, purchase monitoring equipment, train staff, and develop recordkeeping and' reporting systems. Landfills required to install new gas collection and control systems are required to meet these standards upon commencing system operation. It should be noted that landfills that are currently subject to local or federal landfill rules will need to continue to ensure compliance with the 500 ppmv instantaneous standard.

6. Alternative Compliance Options (Section 95468)

Landfills are dynamic sources and there are a number of site-specific factors involved in the design and operation of gas collection and control systems. Accordingly, there may be some very limited cases where alternatives to test methods, monitoring requirements, and operational requirements may warrant consideration. Therefore, the proposed regulation contains a provision that allows owners and operators to request such alternatives, subject to approval of the Executive Officer. Owners and operators will need to demonstrate why consideration of an alternative is necessary in order to comply with the proposed regulation. Any requested alternatives that do not provide equivalent levels of methane emission control or enforceability will not be approved.

7. . **Monitoring Requirements and Test Procedures (Sections 95469 and 95471)**

Surface Emissions Monitoring

The proposed regulation specifies procedures for conducting instantaneous and integrated surface monitoring. In both cases, the landfill is divided into individually identified 50,000 square foot grid patterns. This allows for better identification and tracking of any surface leaks or problem areas. Monitoring is performed quarterly using a portable hydrocarbon detector, such as an organic vapor analyzer or a toxic vapor analyzer set in flame ionization detector mode. The walking pattern must be no more than a 25-foot spacing interval and must traverse each monitoring grid. Landfill owners and operators are given three opportunities to repair or remediate any leaks before it constitutes a violation.

The proposed regulation provides an incentive for establishing a history of compliance with the surface emission standards. If the landfill owner or operator has no *exceedances* of the surface methane emission standards after four consecutive quarterly monitoring periods, the monitoring procedures provide an incentive which allows the walking pattern spacing to be increased to 1DO-foot intervals. Additionally,

closed and inactive landfills can also increase their sampling period from quarterly to annually. The increased spacing and sampling period can continue to be used as long as the landfill remains in compliance with the surface methane emission standards.

Landfill owners or operators of closed or inactive MSW landfills, or any closed or inactive areas on an active MSWlandfills, have an additional incentivef9rearly compliance. To qualify for this incentive, the landfill must demonstrate that in the past three years prior to the effective date ofthe proposed reg'ulation that there were no measured exceedances of the surface methane emission standards by annual or quarterly monitoring. If a successful demonstration is made, the landfill owner or operator may monitor compliance with the surface methane emissions standards annually and may increase the walking pattern spacing from 25-foot to 100-foot intervals. The increased spacing and sampling period can continue to be used as long as the 'landfill remains in compliance with the surface methane emission standards.

Gas Control System Equipment Monitoring

The proposed regulation contains a component leak standard of 500 ppmv. The purpose of the component leak testing requirement is to ensure that there are no point sources along the positive pressure side of gas transfer path with methane concentrations exceeding 500 ppmv. Landfills are required to conduct this monitoring on a quarterly basis. Additionally, the proposed regulation specifies monitoring parameters for gas control devices such as flares to ensure that these devices are operating optimally and meeting the destruction efficiency standards.

Wellhead Monitoring

Monthly well monitoring is required to demonstrate that the gas extraction rate for an active gas collection system is sufficient. A negative pressure must be maintained at each wellhead, except under certain conditions (for example a landfill subsurface fire, fire prevention, repair of the gas collection system, or construction activities). If a positive pressure is measured, the owner or operator must initiate corrective action, including, but not limited to, any necessary expansion of the gas collection system. Any expansion of the gas collection system must be completed and all new wells operating within 120 days of the date the positive pressure was measured.

8. .Recordkeeping and Reporting Requirements (Section 95470)

In order to assure and monitor compliance with the requirements of the proposed regulation, landfill owners and operators are subject to recordkeeping and reporting requirements. These requirements include maintaining records of a landfill's waste acceptance rate, instantaneous and integrating surfacing sampling, component leak checks, equipment downtime, gas flow rates, and control device destruction efficiency testing. Most records are required to be kept for a five-year period; however, control device records must be maintained for the life of the control device. Some of these recordkeeping items are required to be included in the annual report, which must be

submitted annually and cover the period of January 1 through December 31 of each year. Additionally, there are some specific reports that need to be submitted under specific conditions, such as a waste-in-place report for landfills with under 450,000 tons of waste-in-place or a closure notification report for landfills that are ceasing waste acceptance and closing. Finally, an equipment removal report is required when a landfill is seeking to decommission the gas collection and control system.

9. Definitions (Section 95476)

To ensure common understanding and improve enforceability of the regulation this section provides definitions that are similar to those currently being used in existing rules and regulations pertaining to emissions from MSW landfills.

B. Implementation and Enforcement of the Proposed Regulation

The local air districts currently implement and enforce rules related to the control of toxics and NMOCs from landfills and, pursuant to the Health and Safety Code, are the primary implementation and enforcement agency for airborne toxic control measures adopted by ARB. The proposed regulation is developed pursuant to AB 32, which does not explicitly provide for local air district implementation and enforcement. Therefore, the proposed regulation reflects ARB's role as primary monitor and enforcer of regulations adopted under AB 32. However, ARB staff is exploring mechanisms by which local air districts can participate as partners in monitoring compliance with and enforcing the proposed regulation. ARB staff believes local air district participation is critical to assure compliance with the proposed regulation, to help ARB attain GHG emission reduction goals, to reduce the cost of implementing the proposed regulation, and to reduce governmental redundancy. In addition, local air districts are familiar with landfill operations and currently issue permits and inspect landfills and related landfill gas and emissions control equipment.

One potential mechanism may be an agreement between a local air district and ARB in which the local air district assists ARB with monitoring compliance with and enforcing the proposed regulation. Under this approach, an air district's ability to recover its costs associated with implementation and enforcement may be an issue. Accordingly, the proposed regulation allows ARB to consider such agreements and includes a provision (Section 95473) that requires the owner or operator to pay any fees assessed by the local air district pursuant to any such agreement. Another mechanism may be for ARB to work with interested local air districts on their adoption of an equivalent or more stringent local rule that meets the requirements of the proposed regulation. Under this latter approach, ARB anticipates that a local air district would most likely be able to use their existing fee and permitting authority to appropriately address any cost recovery issues. These or any other mechanism considered would be structured to ensure that ARB retains the necessary authority to monitor and enforce the regulations, which will also be evidenced by ARB's maintained authority to directly implement and enforce the proposed regulation as ARB deems necessary. In addition, this statewide regulation will constitute the regulatory floor.

C. .Alternatives Considered .

California Government Code section 11346.2 requires ARB to consider and evaluate reasonable alternatives to the proposed regulation.. Staff evaluated five key alternatives to the proposed regulation to minimize methane emissions from MSW landfills.

1. No Action

A "no action" alternative would forego the adoption of the proposed regulation, This alternative was rejected as it would result in failure to make progress in reducing emissions of methane, aGHG with a high global warming potential, from MSW landfills.

2. Instantaneous Surface Methane Standard of 200 ppmv

ARB staff had initially proposed establishing an instantaneous surface methane standard of 200 ppmv (compared to the 500 ppmv standard in federal and local air district rules). However, stakeholders expressed the concern that a 200 ppmv surface methane emission limit may cause landfill fires and decrease the ability to meet federal wellhead monitoring limits for oxygen and nitrogen. Additionally, CIWMB's landfill fire expert also expressed a concern about potential landfill fires (CIWMB, 2008). This potential exists as it is possible for landfill operators to potentially "overdraw" their g'as collection and control systems thereby introducing excess amounts of oxygen into the landfill.

Given that current regulations only require reporting of exceedances above a 500 ppmv instantaneous surface standard, no data was available to ascertain at what level a landfill fire would result. Therefore, given the catastrophic nature ofa landfill fire, the instantaneous surface limit was set at 500 ppmv, However, the proposed regulation requires reporting of instantaneous readings of 200 ppmv and greater in an effort to collect additional data to help ARB staff understand at what level landfill fires may become a concern.

3. Phase-in of the Integrated Surface Sampling Standard

Some stakeholders commented that ARB staffs proposed 25 ppmv integrated surface sampling standard was new in the industry. The indicated preference was to use 50 ppmv and implement a data collection scheme and use that information to phase-in a lower standard at some point in the future. Based on the compliance data obtained from SCAQMD (SCAQMD, 2007), ARB staff believes that a 25 ppmv standard is feasible. However, it is reasonable to expect that some landfills will require some time to make the necessary adjustments to their gas collection and control systems and operational practices, as appropriate, Therefore, the proposed regulation maintains the 25 ppmv standard but begins compliance with this standard until January 1,2011 (about one year after the effective date of the proposed regulation).

4. Wellhead Methane Concentration

Some stakeholders expressed the belief that wells under vacuum and having a methane concentration of 55 percent or less are good indicators of high landfill gas collection efficiency. Other stakeholders indicated that wellhead methane concentrations can and do vary somewhat over 55 percent and that such a limit was only critical to those landfills with landfill gas-to-energy projects and would otherwise be difficult to maintain. ARB staff concurs with this assessment and recognizes the importance of increased management of wellhead methane concentrations for these landfills. As a compromise, a requirement to maintain wells under a vacuum (as appropriate) was added. This requirement helps ensure that the gas collection and control system is operating efficiently and helps the landfill to comply with the surface emission standards. It may also help minimize methane levels in groundwater.

5. Extended Time to Install Gas Collection and Control Systems at Closed and Inactive MSW Landfills

A few comments from stakeholders were received stating that at least a five-year period would be needed for closed or inactive landfills to obtain the necessary funding to install a gas collection and control system, if required. ARB staff recognizes the challenges in securing the necessary funds to comply but also is mindful of methane's high global warming potential and the need for timely action. As a compromise, the time period for installing controls at closed or inactive MSW landfills was revised from 18 months to 30 months. ARB staff believes that the additional year will provide sufficient time to secure the necessary funds while still enabling ARB to meet its GHG reduction goals.

D. Public Outreach

In complex rulemaking, the Administrative Procedures Act (Government Code section 11340 *et seq.)* requires ARB to involve potentially regulated parties before publishing its notice of proposed rulemaking. Staff has made extensive efforts to provide opportunities for participation in the rulemaking process. Staff's public outreach efforts included meetings with stakeholders through a series of technical workgroup meetings and public workshops. These groups included representatives from the solid waste industry, local air districts, local enforcement agencies, CIWMB, U.S. EPA, environmental organizations, and other interested parties.

Staff's outreach activities included the following:

- Formed the Landfill Technical Review Workgroup and conducted seven workgroup conference calls/meetings with group members;
- Held three public workshops;
- Made extensive personal contacts with industry representatives and other interested parties through meetings, telephone calls, emails, and mail-outs;
- Created a website and maintained an email address list to automatically update interested parties about rulemaking developments;

- Mailed workshop notices and posted workshop materials on the website; and
- Conducted seven site visits to landfills to observe landfill operations and demonstrations of emerging landfill technologies.

VI. ENVIRONMENTAL IMPACTS

A. Introduction

The proposed measure is intended to reduce the impact of GHG on the environment by reducing methane emissions from landfills. This chapter describes the potential impacts of the proposed measure on air, water, energy, noise, and vegetation. Based on .available information, ARB staff has determined that no significant adverse environmental impacts should occur as a result of adopting the proposed regulation.

B. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential environmental impacts of proposed regulations. Because ARB's program involving the adoption of regulations has been certified by the Secretary of Resources pursuant to Public Resources Code section 21080.5, the CEQA environmental analysis requirements may be included in the Initial Statement of Reasons (ISOR) for this rulemaking. In the ISOR, ARB must include a "functionally equivalent" document, rather than adhering to the format described in CEQA of an Initial Study, a Negative Declaration, and an Environmental Impact Report. In addition, staff will respond, in the Final Statement of Reasons for the proposed regulation, to all significant environmental issues raised by the public during the public review period or at the Board public hearing. .

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- An analysis of reasonably foreseeable environmental impacts of the methods of compliance;
- An analysis of reasonably foreseeable feasible mitigation measures (CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts); and
- An analysis of reasonably foreseeable. alternative means of compliance with the proposed regulation.

ARB staff's analysis of these requirements is presented below. We have concluded that the proposed regulation is needed to reduce methane emissions from MSW landfills pursuant to AB 32 (California Global Warming Solutions Act), and to fulfill the goals of the ARB's landfill methane capture strategy adopted by the Board in June 2007. We have also concluded that implementation of the proposed measure will have no significant adverse environmental consequences requiring mitigation and that there are no alternative means of compliance with the requirements of AB 32 that would achieve similar methane reductions at a lower cost.

·C. .Potential Environmental Impacts

1. Air Quality

The combustion of landfill gas, like any other similar process, generates pollutants. Control devices such as engines, flares, gas turbines, and other combustion-based technologies produce, in addition to CO_2 and water, other combustion products which can potentially be detrimental to the environment. Chapter IV discusses the GHG . reductions that are expected to results from the implementation of the proposed regulation. However, the implementation of the proposed regulation is not expected to increase criteria pollutant emissions such as NO_x and CO for the currently 14 uncontrolled landfills that may require controls. Energy recovery systems such as IC engines may slightly increase criteria pollutants when compared to flaring the gas. However, staff is not anticipating the installation of energy recovery systems at any of the 14 uncontrolled landfill due to the high cost of installing such systems compared to an enclosed flare. Accordingly, any increases in criteria pollution emissions are expected to be insignificant.

Measurable amounts of toxic compounds (or NMOCs) can be found in landfill gas at some sites. Under California's landfill gas testing program (Health and Safety Code section 41805.5), MSW landfills were tested for 10 toxic compounds: vinyl chloride, benzene, ethylene dibromide, ethylene dichloride, methylene chloride, perchloroethylene, carbon tetrachloride, methyl chloroform, trichloroethylene, and chloroform, to determine if these compounds were being emitted into the air. Analysis of the test results by ARB indicated that the toxic composition of landfill gas is highly site-specific. Gas collection systems with flares or other combustion devices are currently the best means of reducing methane (a potent greenhouse gas) and the potential risk to surrounding populations posed by emissions of toxic air contaminants contained in landfill gas. The proposed regulation is expected to reduce emissions of these toxic compounds because the control technologies for both toxics and GHGs from MSW landfills are complementary. Table VI-1 shows the potential NMOC reductions than are expected with implementation of the proposed regulation.

Table VI-1. NMOC Reductio,ns for California Landfills

	NMOC Emission Reductions (Tons)		
Year	2011	2015	2020
Total	13,700	21,300	22,800

Local air district permitting requirements for new or modified sources such as landfill gas control devices vary. Each, however, includes a control technology requirement and a mitigation requirement for the residual emissions after control. Some districts provide exemptions from the mitigation requirements for required air pollution control technology while others do not have this exemption. Any increase in the generation of .

criteria pollutants as a result of landfill gas combustion will need to be evaluated by each local air district to ensure that State and national ambient air quality standards are maintained in their respective air basins. This potential increase in criteria pollutant emissions is a potential concern when landfill gas-to-energy projects are being considered. Depending on a local air district's non-attainment status and their specific local requirements, emission control devices and/or offsets may be required before a permit can be issued.

2. Water Quality

The main impact on water quality associated with gas collection systems is the generation of leachate (also referred to as "condensate") from landfill gas. Standard practice in the past was to return the collected leachate to the waste. However, this practice is currently prohibited by the Regional Water Quality Control Boards (RWQCB). The current practice is to store the collected leachate in double-wailed tanks which can be periodically pumped out. The collected leachate is then transported to a disposal facility. This practice significantly mitigates the potentially adverse environmental impact of leachate disposal.

Unlike modern landfills, very few older landfills had liners and leachate removal systems to preventthe leachate from moving out of the landfill. Gas may migrate from an uncontrolled landfill in such a manner as to contaminate the groundwater. In such a case, HWQCB may require the installation of a gas collection system as part of the remedial action. Modern landfills are equipped with liners and leachate removal systems to prevent contamination to the groundwater. The proposed regulation contains a provision to ensure that wellheads are maintained under a vacuum. This requirement, in conjunction with the surface methane emissions standards, helps ensure that methane is routed through the gas collection system to a gas control device. Therefore, the proposed regulation is not expected to have an impact on the effectiveness of liners or the operation of leachate removal systems and,in some cases, may help reduce the methane levels in groundwater.

3. Energy

Landfill gas collection systems without energy recovery devices (e.g., boilers or engines) require energy to run the blowers and pumps. The power requirements of a gas collection and control system installed at the 14 uncontrolled landfills (out of a total 218 affected) is not expected to place an undue burden on existing electrical generation or distribution capacities.

4. Noise

Major noise associated with gas collection systems are from blowers used to extract gas from the site. Most landfills are located in remote areas away from sensitive receptors. However, if surrounding populations are near a site, blowers, engines and other such equipment are typically located in the remote areas of the site to mitigate

noise impacts. If this is' not feasible, the equipment can be enclosed in a building or surrounded by a retaining wall to effectively mitigate noise impacts. The proposed regulation requires the installation of blowers as part of gas collection control systems for those landfills with 450,000 tons or more of waste-in-place that do have these' systems. Given the options to mitigate noise and the remoteness of the uncontrolled landfills, compliance with the proposed regulation is not expected to present any additional noise concerns.

5. Vegetation

In areas where wells, trenches, pumps, and other gas collection system components are installed, the vegetation is disturbed. After installation, landfills typically replace the disturbed vegetation. In general, the net effect on on-site vegetation is expected be positive due to the reduction in the amount of landfill gas seeping through the cover into the root zone. High CO_2 and methane concentrations and low oxygen levels can be injurious to many types of vegetation.

D. Reasonably Foreseeable Feasible Mitigation Measures

ARB staff has concluded that no adverse environmental impacts should occur from adoption of and compliance with the proposed regulation. Therefore, no further mitigation would be necessary. Reducing methane emissions from MSW landfills will also remove NMOCs that would have otherwise been emitted. The potential benefits of the proposed regulation on reducing gas migration, odors, and water quality impacts have not been quantified.

E. Reasonably Foreseeable Alternative Means of Compliance

Alternatives to the proposed regulation have been discussed earlier in Chapter V of this Staff Report. ARB staff has concluded that there are no alternative means of compliance with the requirements of AB 32 that will achieve similar methane emission reductions at a lower cost. Therefore, staff has determined that no alternative to the proposed regulation would be more effective and none would be as effective less burdensome to affected private persons.

Alternatives to not complying with the regulations would result in potential methane emissions to the atmosphere. As previously stated, methane is a major contributor to global climate change having a global warming potential 21 times that of CO_2. Instead, methane can be combusted and converted to CO_2 and water, or it could 'be used as a source of auxiliary power generation for neighboring facilities, which could potentially reduce costs and air toxics from the extra power usage if the landfill gas is not harnessed.

F. Environmental Justice and Community Health

1. Environmental Justice

Environmental justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation,and enforcement of environmental laws, regulations, and policies. ARB is committed to integrating environmental justice into all of our activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for integration of environmentaljustice into ARB's programs, consistent with the directive of California state law. These policies apply to all communities in California, however, environmental justice issues have been raised specifically in the context of low-income areas and ethnically diverse communities (ARB, 2001 a).

Our environmental justice policies are intended to promote the fair treatment of all Californians and cover the full spectrum of ARB's activities. Underlying these policies is a recognition that the agency needs to engage community members in a meaningful way as it carries out its activities. ARB recognizes its obligation to work closely with all communities, environmental organizations, industry, business owners, other agencies, and all other. interested parties to successfully implement these policies.

The proposed regulation is consistent with our environmental justice policy to reduce health risk in all communities, including those with low-income and ethnically diverse populations, regardless of location. Potential risks from global warming due to GHGs can affect both urban and rural communities. Therefore, reducing emissions of GHGs from landfill operations will provide benefits to both urban and rural communities in the State, including low-income and ethnically diverse communities. The decrease in GHG emissions will occur in areas where landfill operations are generally located, which is typically far from most residential areas.

2. Potential Health Impacts

Methane is not a toxic air contaminant; however, toxic air contaminants such as vinyl chloride, benzene, ethylene dibromide, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene are present in landfill gas. By installing gas collection and control systems at MSW landfills thatare currently uncontrolled, toxic air contaminants contained in the landfill gas will also be reduced, thereby minimizing the public's potential exposure to these compounds. Staff therefore concludes that public health will not be adversely affected by the proposed regulation. Compliance with the proposed regulation will not result in any adverse localized impacts.

VII. ECONOMIC IMPACTS

This chapter presents the economic impacts associated with implementation of the proposed regulation. Capital and recurring costs are presented for both private landfills (businesses) and landfills owned/operated by government agencies, including cities and counties. Some landfills owned by government agencies, usually the smaller landfills, are operated under contract by businesses; however, the responsibility for regulatory compliance is still borne by the government entity.

ARB staff has quantified the economic impacts to the extent feasible, but forward-looking estimates such as this one are subject to uncertainty, being based on unpredictable future compliance behavior and actions. In addition, due to the many site-specific factors (as well as their complex interaction) influencing landfill gas collection and control system, design and costs, a comprehensive cost analysis of each affected landfill was not feasible. The cost estimates are based on average or typical costs for the actions necessary to comply with the proposed regulation. It is acknowledged that the actual costs to an affected landfill may be lower or higher than estimated, but the total cost to all affected landfills is expected to be consistent with the stated estimates.

The individual landfill compliance threshold trigger dates stated in this analysis are generated for cost estimation purposes only and are not intended to indicate actual compliance dates. Actual compliance dates and actions for individual landfills should be determined by the methods specified in the proposed regulation.

This analysis assumes the scenario where the use of enclosed flare technology is solely used for compliance. Many existing landfills, especially the larger ones, successfully employ various alternative technologies to use the captured landfill gas to generate energy for use at the landfill or for other purposes. Due to the specialized nature and objectives of these alternative technology projects, no attempt was made to either include these projects in the cost analysis or predict the future rate at which landfill operators may choose this compliance option. To the extent that these projects produce a profit, compliance costs may be reduced for those landfills.

A. Summary

Staff estimates that the total cost of the proposed regulation to affected privately owned and/or operated landfills (businesses) would be approximately 110 million dollars over the 23-year analysis period (assumed lifetime of the regulation) used (i.e., from 2010 to 2033). A majority of the affected landfills are owned and/or operated by government agencies (local, State, and Federal), and these landfills are expected to incur the majority of the cost of the proposed regulation. Estimated costs for the government agency landfills would be approximately 225 million dollars over the previously mentioned analysis period. Costs for ARB enforcement and outreach efforts are expected to be within the range of $25,000 to 1.2 million dollars annually over the analysis period. A small number (less than six) of affected landfills are owned and/or "

operated by school districts or universities, based on landfill registration data. Thus, ,no significant impacts to school districts or universities are expected.

The 'cost-effectiveness is estimated to be approximately $9 per metric ton of carbon dioxide equivalents reduced (average). The total cost of the regulation spread over all California households is estimated at about 10 cents. per month (average) over the lifetime ofthe regulation.

B. Legal Requirements

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California's jobs, business expansion, elimination or creation, and the ability of California businesses to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any State or local' agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

Health and Safety Code section 57005 requires ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding $10 million in any single year. . Although the estimated cost of the regulation to California businesses alone does not exceed $10 million in a single year, given that the annual cost to both businesses and government agencies is expected to exceed $10 million in a single year and the total cost of the regulation is estimated at approximately $335 million, the proposed regulation is being considered a major regulation (ARB, 2009a).

The proposed rulemaking does not constitute a reimbursable mandate because the proposed regulation applies to all entities that own/operate the affected landfills in the state and does not impose unique requirements on local agencies (County of Los Angeles vs. State of California, 43Cal 3d 46 [Jan 1987]).

C. Economic Impact Analysis

This analysis is performed in the year 2009 and all costs are given in 2008 dollars (unless otherwise noted). Where future costs are mentioned, they have been adjusted to 2.008 dollars using standard accepted economic analysis procedures. A real interest rate of 5 percent (a 7 percent nominal rate minus an assumed 2 percent inflation rate) is used throughout this analysis, unless otherwise noted.

Initial (or capital) costs, as discussed in this report, are the up-front costs of a

compliance expenditure. The initial costs are expressed as a uniform series of payments over the assumed useful life (15 years) of the gas control system (and gas collection system, if applicable), using a real interest rate of 5 percent The interest rate for capitalization is assumed to reflect the current borrowing costs to affected businesses.

The costs to businesses and government agencies are discussed in separate sections below; the total cost discussion at the end of this chapter includes the costs to both types of landfill owner/operators as well as a discussion of the cost-effectiveness of the proposed regulation. Additional information regarding the analysis is provided in Appendix F.

Analysis Approach

This analysis is intended to estimate the incremental costs associated with the compliance requirements of the proposed regulation. Incremental costs are the increase or decrease in baseline costs (i.e., the normal cost of doing business without the imposition of the regulation's requirements) due to actions that must be taken for compliance.

Analysis Period Selection

Since the majority of the capital expenditures by directly-affected businesses will likely occur after the mandated analysis period, the analysis period has been expanded to the year 2033. The analysis period of 2010 to 2033 was selected based on the effective date of the proposed regulation (2010), with the last of the affected businesses initiating compliance action by the year 2018; a 15-year amortization period for these businesses extends to the year 2033.

Affected Landfill Inventory

CIWMB tracks landfill operations in the State through their Solid Waste Information System (SWIS). With the assistance of CIWMB staff, 367 landfills were identified as receiving municipal solid waste, one of the applicability criteria of the proposed regulation. Of these 367 landfills, 149 were not affected by the proposed regulation due to not having received municipal solid waste on or after January 1, 1977 or had an operational status of closed or inactive by the year 2010 (the effective date of the proposed regulation). While review of the landfill inventory revealed tribal government-owned/operated landfills, none are expected to be affected by the proposed regulation. The ownership status of the remaining 218 landfills is summarized in Table VII-1 (next page).

Table VII-1. Ownership Status of Affected Landfills

Status	Number of Landfills	Expected Compliance Action
Private	60	Reporting Only[1] - 11 Controls/Monitoring[2] - 49
Government (all) (total)	158	Reporting Only - 61. Controls/Monitoring - 97
Government (subtotals):		
- Local	141	Reporting Only - 47 Controls/Monitoring - 94
- State	2	Reporting Only - 1 Controls/Monitoring - 1
-Federal	6	Reporting Only - 6 Controls/Monitoring - 0
- Military	9	Reporting Only - 7 Controls/Monitoring - 2

1. Landfills that are expected to be subject to reporting reqUirements only.
2. Landfills that are expected to be subject to control and/or monitoring and reporting requirements.

Determination of Small and Tvpical Business Size

Commonly, a business revenue threshold (typically selected after analysis of industry-specific financial data) has been employed to determine small businesses for the purpose of these analyses. However, given that many business-owned and/or operated landfills are privately held, the revenue data needed to determine if a landfill can be considered a small business are unavailable.

In addition, with the majority of the affected landfills being owned/operated by government agencies, normal small business revenue thresholds are not applicable. This requires the use of known landfill qualities other than revenue to determine small and typical business classifications.

One known quality for all affected landfills is the amount of waste-in-place (WIP), an indicator of the past (and for open landfills, current) revenue stream for a landfill. The waste-in-place figure is used in the proposed regulation as one of the two criteria for determining' whether a landfill will need to perform monitoring and possibly install collection and control systems, a significant cost threshold.

The second criterion used for small busines·s determination is the operational status of a landfill. Open landfills and active landfills receive tipping. fees and other sources of revenue which can help pay for regulatory compliance costs; closed or inactive landfills lack this revenue stream and, especially for smaller landfills (likely owned by smaller businesses), would have a lowered ability to pay for compliance costs. Another

consideration is the methane emissions-generating potential of a landfill; smaller landfills (those with less than 450,000 tons of waste-in-place) as a group, are not expected to generate sufficient methane to make operation of a control device (assumed to be an enclosed flare) feasible.

For the purposes of this analysis, the 450,000 tons 'of waste-in-place threshold and the operational status were used to determine the small business threshold. Closed or inactive status (as of the year 2010) with less than 450,000 tons of waste-in-place are considered small businesses and are exempt from the proposed regulation. Typical businesses are considered those landfills subject to reporting requirements only (open or active status, with less than 450,000 tons of waste-in-place) or subject to the monitoring, control, and reporting requirements as described in the proposed regulation.

1. Business 1mpacts/Competitiveness **Discussion**

The majority of the affected landfills are owned and/or operated by government agencies at the local, State, or Federal level. Due to the longer compliance lead-time for closed landfills, as well as the opportunity to delay control system installation through improved landfill surface maintenance and available funding mechanisms, ARB staff believes that most, if not all, of these agencies, as well as affected private businesses, will be able to meet the proposed regulation's compliance costs. However, it is possible that a small number of businesses (those with marginal profitability) may experience financial difficulty in complying with the proposed regulation.

It is expected that businesses will pass on compliance costs to private individuals and households through increased waste disposal costs. To the extent that compliance costs cannot be passed on to private individuals, costs will have to be absorbed. Government agencies may handle compliance costs through any or a combination of the following methods: redirection of budget funds from other programs, issuance of bonds, regulatory compliance surcharges or assessments, and increased waste disposal fees.

Potential Employment Impact

The proposed regulatory action may lead to the creation of some businesses as well as the expansion of existing businesses. Businesses created include those that design, furnish, install, monitor, and maintain landfill gas collection and control systems, as well as those that provide alternative compliance strategies (including waste-to-energy technologies). Existing businesses that provide the aforementioned scope of services and products are likely to see an increase in business due to the requirements of the proposed regulation.

Potential Business Creation or *Expansion*

Staff believes that the proposed reg.ulation may lead to the alteration of job duties within existing businesses, as well as a small increase in new jobs for a few businesses due to

the creation of business opportunities as discussed in the previous paragraph. Staff believes that there will be little or no significant change in the total number of businesses or jobs.

The proposed regulatory acfion would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

The proposed regulatory action is not expected to have an impact on small businesses. Small businesses (landfills with less than 450,000 tons of waste-in-place and closed or inactive status) are exempt from all compliance requirements of the proposed regulation.

2. Cost to Affected Businesses

There are 60 California landfills owned and/or operated by businesses that are expected to be affected by the proposed regulation. Of these 60 landfills, 11 are projected to be subject only to the waste-in-place and landfill gas heat input capacity reporting requirements. The remaining 49 landfills are expected to be subject to the reporting requirements as well as control and/or monitoring requirements.

The incremental cost of the proposed regulation (cost increases or savings resulting from a business' actions to comply with the regulatory requirements) was estimated for the affected landfills. Landfill compliance actions were divided into four categories for cost estimation and to compile the total costs. The four categories and the applicability of each to affected landfills are listed below in Table VII-2 (next page).

Table VII-2. Cost Categories and Applicability for Landfills
(with.> 450,000 **Tons** WIP and >= 3.0 MM Btu/hr)

Cost **Category**	Applicability
Capital (initial)	- Uncontrolled Landfills
	- Landfills w/ Open Flares[1]
Operation and Maintenance	- Uncontrolled Landfills
	- Landfills w/ Open Flares
Monitoring	- Controlled Landfills
	- Uncontrolled Landfills
	- Landfills w/ Open Flares
Reporting	- All Affected Landfills

1. Treated as a separate category because these landfills are required to Install enclosed flares (with associated costs) by 2018.

For each affected landfill, costs were estimated in each of the four categories listed above and then summed on a per-landfill basis. These individual costs were then .summed by landfill ownership status classification (see Table VII-2 for classifications; Table VII-4 for government agency costs) and also by landfill compliance action needed (Table VII-3).

Due to widely varying landfill characteristics influencing estimated compliance costs, even among similar-sized landfills, using the costs for a single landfill in a decision-making process can be.misleading. Instead, ARB staff used the average of the costs for all landfills because we believe it provides a more reasonable estimate. Actual costs for any given landfill may be higher or lower than the estimate, but the overall cost is expected to be consistent with the stated estimates.. The estimated costs for these landfills are summarized in Table VII-3.

Table VII-3. Estimated Costs to Affected Businesses[1]

Landfill Compliance Action	Capital (lump sum) (2008 $)	Annual Operation & Maintenance	Monitoring	Reporting	Total
ReportinQ Onlv	--	--	--	$10,100	$10,100
Controls/Monitoring	$8.1 million	$43 million	$60 million	$47,000	$111 million
Totals	$8.1 million	$43 million	$60 million	$54,200	$111 million

1. All numbers have been rounded.

3. Cost to Government Agencies

Costs to Local and Federal Government Agencies

The majority of the affected landfills are owned and/or operated by government agencies at the local, State, or federal level. The compliance requirements and deadlines are the same for both businesses and government agencies. For an explanation of the cost analysis methodology used, please see the discussion in the previous section, Cost to Affected Businesses. The estimated costs for the government agency owned/operated landfills are summarized in Table VII-4 (next page).

While local air pollution control districts are considered local or regional agencies, they do not own or operate landfills and would not incur landfill owner/operator compliance costs. However; to the degree that local air districts have an agreement with ARB to implement and enforce the proposed regulation, these districts would incur enforcement costs. Enforcement costs to local air districts are described in the next section, Costs to ARB and Local Air Districts.

Table VII-4. Cost to Affected Government Agencies[1]

Landfill Compliance Action	Capital (lump sum) (2008 $)	Annual Operation & Maintenance	Monitoring	Reporting	Total
Reporting Only--					
Ali Government (total)	--	--	--	$129,000	$129,000
- Local	--	--	--	$88,000	$88,000
- State	--	--	--	$3,800	$3,800
- Federal	--	--	--	$13,000	$13,000
- Tribal	--	--	--	0	0
- Military	--	--	--	$25,000	$25,000
Controls/Monitoring--					
Ali Government (total)	$19 million	$105 million	$101 million	$120,000	$225 million
- Local	$17 million	$96 million	$95 million	$120,000	$208 million
- State	0	0	$420,000	$130	$420,000
- Federal	0	0	0	0	0
- Military	$2.5 million	$8.7 million	$5.4 million	$3,300	$17 million
Totals (rounded)	$19 million	$105 million	$101 million	$250,000	$225 million

1. All numbers have been rounded. Total cost of the proposed regulation is approximately 335 million dollars over the lifetime of the proposed regulation (2010 to 2033).

Costs to ARB and Local Air Districts

Under the AB 32 guidelines and the proposed regulation language, ARB will have lead authority for enforcement and implementation of the regulatory requirements. This authority would include enforcement activities as well as review and approval of design plans (both initial and updates) submitted by the landfill owner/operators and quarterly monitoring reports. To an unknown degree, some or all of ARB's responsibilities may be delegated to the local air districts via an agreement between ARB and individual local air districts.

The ARB expects costs for enforcement and outreach efforts to be within the range of $25,000 to 1.2 million dollars annually over the analysis period. The variability in the cost range is due to the unknown degree to which local air districts will enter into agreements to implement and enforce the proposed regulation with ARB. The low end of the cost range assumes that all local air districts that currently have rules controlling landfill gas emissions (landfills in these districts are currently under district permits) will

seek such an agreement. The high end of the cost range assumes that none of the local air districts enter into an agreement with ARB, and that all implementation and enforcement will be performed by ARB. ARB staff believes that the 20 local air districts known to have rules affecting landfill gas emissions are likely to enter into an agreement with ARB.

To the extent that local air districts enter into agreements with ARB, costs will be shifted from ARB to the districts. It is expected that the local air districts will fully recover their costs under the existing authority granted to them in the California Health and Safety Code, sections 40702, 40727.2(j), and 41512.5. Additionally, Section 95473 of the proposed regulation also provides a cost-recovery mechanism for local air districts to recover their costs.

Costs to Other State Agencies

State agencies that own or operate landfills are expected to incur costs in complying with the proposed regulation. Two landfills owned/operated by State agencies were identified; the landfill at the University of California at Davis is expected to be subject to reporting requirements only (starting in State fiscal year 2010-2011), with an annual compliance cost estimated at less than $300. The second landfill, which is owned/operated by California Polytechnic University at Pomona, is expected to incur ongoing monitoring costs of approximately $17,000 per year, with a one-time upfront cost of $48,000 for monitoring equipment. These costs would commence in the 2011-2012 State fiscal year.

4. Total Cost and Cost-Effectiveness of Proposed Regulation

Total Cost

The total cost to affected public agencies and to affected persons and businesses would be approximately 27 million dollars in initial capital costs with about 6.4 million to 14 million dollars in annual recurring costs (in 2008 dollars.) These costs correspond to 6.4 million to 16 million dollars annually over the 23-year life of the regulation, or a total cost of about 335 million dollars. These costs are summarized in the Table VII-5 (next page).

Table VII-5. Estimated Compliance Costs for All Affected Landfills

Landfill Compliance Status	Reporting Costs[1]	Capital Costs[2]	Operation and Maintenance Costs[3]	Monitoring Costs[4]
Landfills Subject to Reporting Reauirements Onlv	$139,000	N/A	N/A	N/A
Landfills Having Existing Compliant Control Systems	$154,000	$2.4 million	$56 million	$151 million
Landfills Without Existing Compliant Control Systems	$15,000	$25 million	$92 million	$8.6 million
Totals	$308,000	$27 million	$148 million	$160 million

1. Costs to affected landfills to prepare and submit reqUired WIP and Landfill Gas Heat Input Capacity reports.
2. Includes engineering, permitting, testing, purchase, installation, shipping, and other initial costs related to the set-up of a new gas collection and control system.
3. Recurring costs for the operation of a gas collection and control system; includes parts and materials, labor, utilities, taxes, and administration.
'4. Monitoring costs include the purchase of monitoring and calibration equipment as well as labor for performing monitoring work as required in the proposed regulation.

Expressed as a per-California household figure, the total cost of the proposed regulation is about 10 cents per month per household over the analysis period. This figure was calculated by taking the total cost and dividing it by the number of households in California (the proposed regulation applies to all California landfills; it is assumed that waste from all California households goes to California landfills) over the 23-year analysis period. A constant figure of approximately 13 million California households (DOF, 2009) over the analysis period was used.

Cost-Effectiveness

Based on ARB staff's year 2020 forecast of landfill emissions, if all 14 of the uncontrolled landfills were to install gas collection and control systems for methane, there would be a reduction of about 0.4 million metric tons of carbon dioxide equivalents (MMTCOzE). The implementation and enforcement of this proposed regulation for the remaining estimated 204 affected MSW landfills (including those with gas collections systems already installed) is expected to result in an additional estimated emission reduction of 1.1 MMTCOzE. Overall, the proposed regulation will result in reductions of about 1.5 MMTCOzE in 2020.

The cost-effectiveness (the ratio of the regulation cost divided- by the emission benefits) is one method of expressing the relative benefit of an air quality regulation. For this proposed regulation, the total cost of the regulation over the analysis period was divided by the statewide emission benefits (except for landfills located in SCAQMD) to calculate the cost effectiveness. As discussed in Chapter V, landfills in the SCAQMD are already subject to SCAQMD Rule 1150.1 which, although focused on toxies and not methane,

has similar requirements. as the proposed regulation; therefore minimal emission reduction benefits are expected from these landfills from compliance with the proposed regulation. .

Landfills in the SCAQMD will still need to comply with the requirements of the proposed regulation. The associated costs for these landfills are included in the total cost of the proposed regulation. The cost-effectiveness is estimated to be approximately $9 per metric ton of carbon dioxide equivalent reduced.

VIII. ONGOING AND FUTURE ACTIVITIES

This following is a list of future and ongoing activities that will be pursued by ARB staff to further minimize methane emissions from MSW landfills.

A. Implementation Guidance Document

ARB staff will develop a guidance document to assist owners and operators in complying with the requirements oUhe proposed regulation. The document will discuss the process used to determine if a gas collection and control system needs to be installed, the compliance schedule, and will explain the monitoring, recordkeeping and reporting requirements. The document will include example report forms to assist owners and operators in meeting their reporting requirements and a Landfill Gas Tool to assist with the determination of a landfill's gas heat input capacities and methane generation rates.

B. Landfill Gas Tool

ARB staff is developing a Landfill Gas Tool to assist owners and operators in estimating their landfill's fugitive methane emissions, potential landfill gas generation rate, and landfill gas heat input capacity. The tool is similar to the tool used by the Local Government Operations Protocol for creating a GHG accounting and reporting standard for local government operations across the United States. The values used in the tool are consistent with those used in ARB's landfill emissions inventory methodology. A draft of this tool is currently available for public review and comment.

C. Improve Understanding of Landfill Emissions and Methane Gas Capture Efficiencies

In March 2006, the California Energy Commission (CEC) initiated a contract as part of the Public Interest Energy Research/CEC landfill methane study (CIWMB, 2007). The goal of this project is to make improvements to the CEC's existing GHG inventory for landfills and to develop a field-validated model that can be implemented on a site-specific basis for determining landfill methane emissions and assigned capture efficiencies. The study will look at different cover materials and configuration, seasonal climate variability, and microbial diurnal responses to assess how each parameter affects methane emissions from the surface. The project is expected to be completed by 2010. The results will be compared to that of similar effort being undertaken by the landfill industry which is using tunable diode laser technology to estimate the methane flux from the surface of a landfill. The results of this industry study are expected by 2010.

D. Future Regulatory Action

As discussed in the AB 32 Scoping Plan, ARB staff will work with CIWMB staff to investigate what regulatory actions can be taken to further reduce methane emissions in

support of the proposed regulation. Such actions may include: specific requirements for gas collection system design, construction, timing, and operation; landfill unit and cell design and construction; waste placement methods; daily and intermediate cover materials and practices; use of compost or other biologically active materials in cover soils; and organic materials management.

IX. REFERENCES

ARB, 1990. Air Resources Board. Suggested Control Measure for Landfill Gas Emissions. Prepared by: California Air Pollution Control Officers Association Technical Review Group Landfill Gas Subcommittee. September 13, 1990.

ARB, 1998. Air Resources Board. Noncombustion Landfill Gas Control Technologies. March 1998.

ARB,2008a. Air Resources Board. R. Crooks, S. Young, R. Green, and N. Stetson: (ARB, CIWMB, WMI) Notes on site visit to Lancaster Landfill to view optical remote sensing/radial plume mapping technology performed by Waste Management Inc. February 13, 2008.

ARB, 2008b. Air Resources Board. Scoping Plan Measure Development and Cost Analysis Template Attachment E.

ARB, 2008c. Air Resources Board. Climate Change Draft Scoping Plan Appendix C, Page 126.

ARB, 2009a. California Air Resources Board. Staff Report: Initial Statement of Reasons for Proposed Regulation to Reduce Greenhouse Gas Emissions From Semiconductor Operations. Sacramento, California. January 2009.

ARB,2009b. Air Resources Board. California Greenhouse Gas Inventory Data http://www.arb.ca.gov/cc/inventory/data/tables/ghg inventory by sector 2007-11-19.xls.

ATSDR, 2001. Agency for Toxic Substances and Disease Registry. Landfill Gas Primer - An Overview for Environmental Health Professionals, Chapter 5, Page 6. November 2001.

BAAQMD, 2007. Bay Area Air Quality Management District. Email correspondence between Carol Allen of BAAQMD and Renaldo Crooks of ARB on methane destruction efficiency data. October 19, 2007.

Bogner, 2007. (http://www.landfillsplus.comD: Summary for Policy Makers-Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. April-May 2007.

CCAR,2008a. California Climate Action Registry. Landfill Project Reporting Protocol, Collecting and Destroying Methane from Landfills, Version 2.0. November 18, 2008.

CCAR,2008b. California Climate Action Registry. Landfill Project Verification Protocol, Capturing and Destroying Methane from Landfills, Version 2.0. November 18, 2008.

CEC, 2006. Inventory of California Greenhouse Gas Emissions and Sinks: 1990.to 2004. CEC Publication CEC-600-2006-013-SF. Available online: http://www.energy.ca.gov/2006publications/CEC-600-2006-013/CEC-600-2006-013 SF. PDF.

CIWMB,2004. California Integrated Waste Management Board. Statewide Profile for the State of California, http://www.ciwmb.ca.gov/Profiles/Statewide/.

CIWMB,2007a. G. Franco, California Energy Commission Public Interest Energy Research Program. Landfill Emissions Estimates, Climate Change Workshop.. May 8,2007.

CIWMB, 2007b. California Integrated Waste Management Board. Overview of Climate Change and Analysis of Potential Measures to Implement Greenhouse Gas Emission Reduction Strategies. CIWMB Strategic Policy Development Committee. May 8,2007.

CIWMB, 2007c. California Integrated Waste Management Board. Scott Walker, Climate Action Team Climate Strategy Update Documentation. August 24,2007.

CIWMB,2007d. Solid Waste Characterization Database, California Integrated Waste. Management Board, Sacramento. Accessed online, fall 2007 at: http://www.ciwmb.ca.govlWasteChar/.

CIWMB,2008. September 2008 e-mail from Todd Thalhammer of CIWMB to ARB on landfill fire risks at closed landfills.

CIVVMB,2009. California Integrated Waste Management Board Local Government Central Statewide Waste Generated, Diverted, and Disposed 1989-2006 Figures: . www.ciwmb.ca.gov/LGCentral/Rates/Graphs/RateTable.htm.

DOF,2009. State of California, Department of Finance, California Current Population Survey Report: March 2007. Sacramento, California. January 2009.

DTSC, 2002. Department of Toxic Substances Control Hazardous Waste Management Program. Hazardous Waste Loadchecking at Municipal Landfills and Transfer Stations, Management Memo #EO-90-001-MM.January 2002.

Environmental Sanitary Engineering Centre, 2003. Thiel, R., S. Purdy and R. Yazdani, Sardinia: "Case History of Exposed Geomembrane Cover for Bioreactor Landfill," CISA.

Ford, 2009. April 21, 2009, e-mail correspondence from Leslie Ford, ARB to Jon Manji, ARB.

Huitric, 1995. Measuring Landfill Gas Collection Efficiency Using Surface Methane Concentrations. Solid Waste Management Department, Los AngeJes County Sanitation Districts.

Imhoff, 2008. Quantifying Capture Efficiency of Gas Collection Systems with Gas Tracers. Department of Civil and Environmental Engineering, University of Delaware. April 24, 2008.

IPCC, 2006a. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T., and Tanabe K. (eds). Volume 2, Chapter 2: Stationary Combustion: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2 Volume2N2 2 Ch2 Stationary Combustion.pdf.

IPCC,2006b. Intergovernmental Panel on Climate Change. GHG Inventories, Volume 5, Chapter 3, Annex 3A.1.

Judge, 2009. Personal Communication, Hardip Judge, ARB, to Jon Manji, ARB, April 7, 2009.

Landtec, 2004. WBS-1 00 Wellbore Seal Product Flyer, 850 South Via Lata, Suite 112, Colton, California 92324.

Locke, 2009a. April 7, 2009 e-mail correspondence from Tim Locke, John Zink Company, to Jon Manji, ARB.

Locke, 2009b. April 8, 2009 e-mail correspondence from Tim Locke, John Zink Company, to Jon Manji, ARB.

Murcal,2009. SCAQMD Rule 1110.2 goes into effect on February 1,2009: http://www.murphyswitch.com/murcal%20pages/scagmd.html.

NRCS, 2007. Map of Average precipitation data for California, US Department of, Agriculture National Resources Conservation Service's Geospatial Data Gateway, Accessed online, fall 2007, at: http://datagateway.nrcs.usda.gov/.

Ping, 2009. AERMOD In and Out Modeling Data. Performed at the California Air Resources Board by Ping Di.

SCAQMD,2007. The 2000-2001 Rule 1150.1 quarterly reports in five boxes from the South Coast Air Quality Management District.

SCS, 2007a. SCS Engineers. Current MSW Industry Position and State of the Practice on LFG Destruction Efficiency in Flares, Turbines, and Engines. Presented to Solid Waste Industry for Climate Solutions (SWICS), July 2007, File No. 01198086.09, Task 1.

SCS, 2007b. SCS Engineers. Current MSW Industry Position and State-of-the Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills. Presented to Solid Waste Industry for Climate Solutions (SWICS), July 2007, File No. 01198086.09, Task 1.

SCS, 2008. Technologies and Management Options for Reducing Greenhouse Gas Emissions From Landfills, SCS Engineers Contractor's Report to the California Integrated Waste Management Board. April,2008.

USDL,2009a. United States Department of Labor, Bureau of Labor Statistics. Occupational Employment Statistics. May 2007 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates. Website Accessed, March 22,2009: http://www.bls.gov/oes/2007/may/oes 41860.

USDL," 2009b. United States Department of Labor, Bureau of Labor Statistics. News Release: Employer Costs for Employee Compensation-"December 2008. USDL: 09-0247. March 12,2009.

U.S." EPA, 1991. Air Emissions from Municipal Solid Waste Landfills – Background Information for Proposed Standards and Guidelines, EPA-450/3-90-011. March 1991.

U.S. EPA, 1999. Municipal Solid Waste Landfills, Volume 1: Summary of the Requirements for the New Source Performance Standards and Emission Guidelines for Municipal Solid Waste Landfills, EPA-453R/96-004.

U.S. EPA, 2002. Solid Waste Management and Greenhouse Gases - A Life Cycle Assessmentof Emissions and Sinks. 2nd Edition, May 2002. Exhibit 7.3 page 107. U. S. Environmental Protection Agency, EPA publication 530-R-02-006 at: http://www.epa.gov/c1imatechange/wycd/waste/SWMGHGreport.html.

U.S. EPA, 2007a. U.S. EPA Innovation Program. Innovative Air Monitoring at Landfills Using Optical Remote Sensing with Radial Plume Mapping.

U.S. EPA, 2007b. Municipal Solid Waste Characterization Reports (various years), "U. S. Environmental Protection Agency. Accessed online, fall 2007, at: http://www.epa.gov/epawaste/inforesources/pubs/municipalsw.htm.

U.S. EPA, 2008. AP-42 (5th Edition) Compilation of Air Pollutant Emission Factors, Volume 1, Chapter 2.4-1 Municipal Solid Waste Landfills.

U.S. EPA, 2009. Landfill Methane Outreach Program. LFG Energy Project Development Handbook, Chapter 4, Project Economics and Financing, pg. 4-3. Online publication: Website Accessed, March 23,2009: http://epa.gov/lmop/res/pdf/pdh chapter4.pdf.

URS, 2008. URS Corporation: Greenhouse Gas Mitigation: Landfill Gas and Industrial, Institutional and Commercial Boilers, Steam Generators and Process Heaters. Prepared for the Bay Area Air Quality Management District. April 2008.

Walker,2007. Personal communication (Collection, LatlLon, and Control Data for Landfills) between Larry Hunsaker of CA Air Resources Board and Scott Walker, California Integrated Waste Management Board. Fall 2007.

Appendix A

Proposed Regulation to Reduce Methane Emissions from Municipal Solid Waste Landfills

PROPOSED REGULATION. ORDER

Adopt new Article 4, Subarticle 6, Methane Emissions from Municipal Solid Waste Landfills, sections 95460 to 95476, title 17, California Code of Regulations, to read as follows:

Note: The entire text below is new language proposed to be added to the California Code of Regulations (CCR).

SUbchapter 10: Climate Change
Article 4: Regulations to Achieve Greenhouse Gas Emission Reductions
Subarticle 6. Methane Emissions from Municipal Solid Waste Landfills

Methane Emissions from Municipal Solid Waste Landfills

§ 95460. Purpose

Th.e purpose of this subarticle is to reduce methane emissions from municipal solid waste (MSW) landfills pursuant to the California Global Warming Solutions Act of 2006 (Health & Safety Code, Sections 38500 et. seq.).

Note: Authority cited: Sections 38501, 38510, 38560,38560.5, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38560.5, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95461. Applicability

This subarticle applies to all MSW landfills that received solid waste after January 1, 1977.

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551,38560,38560.5,39003,39500,39600, and 39601, Health and Safety Code.

§ 95462. Exemptions

(a) This subarticle does not apply to landfills that receive only hazardous waste, or are currently regulated under the Comprehensive Environmental Response, Compensation and Liability Act 42 U.S.C, Chapter 103 *(PromUlgated 12/11/80; Amended 10/17/86).*

(b) This subarticle does not apply to landfills that receive only construction and demolition wastes or non-decomposable wastes.

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551,38560,38560.5,39003,39500,39600, and 39601, Health and Safety Code.

§ 95463. Determination for **Installing a Gas Collection and Control System**

(a) *Active MSW Landfills Less Than 450,000 Tons* of *Waste-in-Place:* Each owner or operator of an active MSW landfill having less than 450,000 tons of waste-in-place must submit a Waste-in-Place Report to the Executive Officer pursuant to section 95470(b)(4), within 90 days of the effective date of this subarticle.

(1) The Waste-in-Place report must be prepared for the period of January 1 through December 31 of each year. The report must be submitted to the Executive Officer by March 15 of the following year.

(2) The Waste-in-Place report must be submitted annually until either:

(A) The MSW landfill reaches a size greater than or equal to 450,000 tons of waste-in-place; or

(B) The owner or operator submits a Closure Notification pursuant to section 95470(b)(1).

(b) *MSW Landfills Greater Than or Equal to 450,000 Tons of Waste-in-Place:* Within 90 days of the effective date of this subarticle or upon reaching 450,000 tons of waste-in-place, each owner or operator of an MSW landfill having greater than or equal to 450,000 tons of waste-in-place must calculate the landfill gas heat input capacity pursuant to section 95471 (b) and must submit a Landfill Gas Heat Input Capacity Report to the Executive Officer.

(1) If the calculated landfill gas heat input capacity is less than 3.0 million British thermal units per hour (MMBtu/hr) recovered, the owner or operator must:

(A) Recalculate the landfill gas heat input capacity annually using the procedures specified in section 95471 (b).

(B) Submit an annual Landfill Gas Heat Input Capacity Report to the Executive Officer until either of the following conditions is met:

1. The calculated landfill gas heat input capacity is greater than or equal to 3.0 MMBtu/hr recovered, or

2. If the MSW landfill is active, the owner or operator submits a Closure Notification pursuant to section 95470(b)(1).

Submitting the Closure Notification fulfills the requirements of this subarticle. If the MSW landfill is *closed* or *inactive,* submittal of the Closure Notification is not required to fulfill the requirements of the subarticle.

(2) If the landfill gas heat input capacity is greater than or equal to 3.0 MMBtu/hr recovered the owner or operator must either:

(A) Comply with the requirements of sections 95464 through 95476, or

(B) Demonstrate to the satisfaction of the Executive Officer that after four consecutive quarterly monitoring periods there is no measured concentration of methane of 200 parts per million by volume (ppmv) or greater using the instantaneous surface monitoring procedures specified in sections 95471(c)(1) and 95471(c)(2). Based on the monitoring results, the owner or operator must do one of the following:

1. If there is any measured concentration of methane of 200 ppmv or greater from the surface of an active, inactive, or closed MSW landfill, comply with sections 95464 through 95476;

2. If there is no measured concentration of methane of 200 ppmv or greater from the surface of an active MSW landfill, comply with section 95463(b) and recalculate the landfill gas heat input capacity annually as required in section 95463(b) until such time the owner or operator submits a Closure Notification pursuant to section 95470(b)(1); or

3. If there is no measured concentration of methane of 200 ppmv or greater from the surface of a closed or inactive MSW landfill, the requirements of sections 95464 through 95470 no longer apply provided that the following information is submitted to and approved by the Executive Officer within 90 days:

a. A Waste-in-Place Report pursuant to section 95470(b)(4);

b. All instantaneous surface monitoring records.

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600" and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551,38560,38560.5,39003,39500,39600, and 39601, Health and Safety Code.

§ 95464. Gas Collection and Control System Requirements

(a) *Design Plan and Installation.*

(1) Design Plan: If a gas collection and control system which meets the requirements of either sections 95464(b)(1), 95464(b)(2) or 95464(b)(3) has not been installed, the owner or operator of a MSW landfill must submit a Design Plan to the Executive Officer within one year after the effective date of this subarticle, or within one year of detecting any leak on the landfill surface exceeding a methane concentration of 200 ppmv pursuant to section 95463(b)(2)(B). The Executive Officer must review and either approve or disapprove the Design Plan within 120 days. The Executive Officer may request that additional information be submitted as part of the review of the Design Plan. At a minimum, the Design Plan must meet the following requirements:

(A) The Design Plan must be prepared and certified by a professional engineer.

(B) The Design Plan must provide for the control of the collected gas through the use of a gas collection and control system meeting the requirements of either sections 95464(b)(1), 95464(b(2) or 95464(b)(3).

(0) The Design Plan must include any proposed alternatives to the requirements, test methods, procedures, compliance measures, monitoring, and recordkeeping or reporting requirements pursuant to section 95468.

(E) A description of potential mitigation measures to be used to prevent the release of methane or other pollutants into the atmosphere during the installation or preparation of wells, piping, or other equipment; during repairs or the temporary shutdown of gas collection system components; or, when solid waste is to be excavated and moved.

(F) For active MSW landfills, the design plan must identify areas of the landfill that are closed or inactive.

(G) Design the gas collection and control system to handle the expected gas generation flow rate from the entire area of the MSW landfill and to collect gas at an extraction rate to comply with the surface methane emission limits in section 95465 and component leak standard in section 95464(b)(1)(B). The expected gas generation flow rate from the MSW landfill must be calculated pursuant to section 95471 (e).

1. Any areas of the landfill that contain asbestos-containing waste or non-decomposable solid waste may be excluded from collection provided that the owner or operator submits documentation to the Executive Officer containing the nature, date of deposition, location and amount of asbestos or non-decomposable solid waste deposited in the area. This documentation may be included as part of the Design Plan.

(H) As operating experience is gained and as site conditions change, the Design Plan may be revised, subject to the approval of the Executive Officer.

(2) Any owner or operator of an active MSW landfill must install and operate a gas collection and control system within 18 months after approval of the Design Plan.

(3) Any owner *or* operator of a closed or inactive MSW landfill must install and operate a gas collection and control system within 30 months after approval of the Design Plan.

(4) If an owner or operator is modifying an existing gas collection and control system to meet the requirements of this subarticle, the existing Design Plan must be amended to include any necessary updates or addenda, and must be certified by a professional engineer.

(5) The gas collection system must be operated, maintained, and expanded in accordance with the procedures and schedules in the approved Design Plan.

(b) Gas *Collection and Control System Requirements.*

(1) *General Requirements.* The owner or operator must satisfy the following requirements when operating a gas collection and control system:

(A) Route the collected gas to a gas control device or devices, and operate the gas collection and control system continuously except as provided in sections 95464(d) and 95464(e).

(B) Operate the gas collection and control system so that there is no landfill gas leak that exceeds 500 ppmv, measured as methane, at any component under positive pressure.

(C) The gas collection system must be designed and operated to draw all the gas toward the gas control device or devices

(2) Requirements for Flares. An MSW landfill owner or operator who operates a flare "must satisfy the following requirements:

(A) Route the collected gas to an enclosed flare that meets the following requirements:

1. Achieves a methane destruction efficiency of at least 99 percent by weight.

2. Is equipped with automatic dampers, an automatic shutdown device, a flame arrester, and continuous recording temperature sensors.

3. During restart or startup there must be a sufficient flow of propane or commercial natural gas to the burners to prevent unburned collected methane from being emitted to the atmosphere.

4. The gas control device must be operated within the parameter ranges established during the initial or most recent source test.

(B) Route the collected gas to an open flare that meets the requirements of 40 CFR 60.18 (as last amended· 65 Fed.Reg. 61752 (October 17,2000), which is incorporated by reference herein. The operation of an open flare is not allowed except under the following conditions:

1. An open flare installed and operating prior to August 1, 2008, may operate until January 1,2018.

2. Operation of an open flare on or after January 1,2018, may be allowed if the owner or operator can demonstrate to the satisfaction of the Executive Officer that the landfill gas heat input capacity is less than 3.0 MMBtu/hr pursuant to section 95471 (b) and is insufficientto support the continuous operation of an enclosed flare or other gas control device.

3. The owner or operator is seeking to temporarily operate an open flare during the repair or maintenance of the gas control system, orwhile awaiting the installation of an enclosed flare, or to address offsite gas migration issues.

a. Any owner seeking to temporarily operate an open flare must submit a written request to the Executive Officer pursuant to section 95468.

(3) Requirements for Gas Control Devices other than Fiares.. An MSW landfill owner or operator who operates a gas control device other than a flare· must satisfy one of the following requirements:

(A) Route the collected gas to an energy recovery device, or series of devices that meets the following requirements:

1. Achieves a methane destruction efficiency of at least 99 percent by weight. Lean burn internal combustion engines must reduce the outlet methane concentration to less than 3,000 ppmy, dry basis, corrected to 15 percent oxygen.

2. If a boiler or a process heater is used as the gas control device, the landfill gas stream must be introduced into the flame zone. Where the landfill gas is not the primary fuel for the boiler or process heater, introduction of the landfill gas stream into the flame zone is not required.

3. The gas control device must be operated within the parameter ranges established during the initial or most recent source test.

(8) Route the collected gas toa treatment system that processes the collected gas for subsequent sale or use. All emissions vented to the atmosphere from the gas treatment system are subject to the requirements of sections 95464(b)(2).

(4) Source Test Requirements: The owner or operator must conduct an annual source test for any gas control device(s) subject to the requirements of sections 95464(b)(2)(A) or 95464(b)(3)(A) using the test methods identified in 95471 *(t).* An initial source test must be conducted within 180 days of initial start up of the gas collection and control system. Each succeeding complete annual source test must be conducted no later than 45 days after the anniversary date of the initial source test.

(A) If a gas control device remains in compliance after three consecutive source tests the owner oroperator may conduct the source test every three years. If a subsequent source test shows the gas collection and control system is out of compliance the source testing frequency will return to annual.

(c) *Wel/head Gauge Pressure Requirement:* Each wellhead must be operated under a vacuum (negative pressure), except as provided in sections 95464(d) and 95464(e), or under any of the following conditions:

"(1) Use of a geomembrane or synthetic cover. The owner or operator must develop acceptable pressure limits for the wellheads and include them in the Design Plan; or

(2) A decommissioned well.

(d) *Well Raising:* The requirements of sections 95464(b)(1)(A), 95464(b)(1)(B), and 95464(c), do not apply to individual wells involved in well raising provided the following conditions are met:

(1) New fill is being added or compacted in the immediate vicinity around the well.

(2) Once installed, a gas collection well extension is sealed or capped until the raised well is reconnected to a vacuum source.

(e) *Repairs and Temporary Shutdown of Gas Collection System Components:* The requirements of sections 95464(b)(1)(A); 95464(b)(1)(B), and 95464(c), do not apply to individual landfill gas collection system components that must be temporarily shut down in order to repair the components, due to catastrophic events such as earthquakes, to connect new landfill gas collection system components to the existing system, to extinguish landfill fires, or to perform construction activities pursuant to section 95466, provided the following requirements are met:

(1) Any new gas collection system components required to maintain compliance with this subarticle must be included in the most recent Design Plan pursuant to section 95464(a)(4).

(2) Methane emissions are minimized during shutdown pursuant to section 95464(a)(1)(E).

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551,38560, 38560.5,39003,39500,39600, and 39601, Health and Safety Code.,

§ 95465. Surface Methane Emission Standards

(a) Except as provided in sections 95464(d), 95464(e), and 95466, beginning January 1, 2011, or upon commencing operation of a newly installed gas collection and control system, no location on the MSWlandfill surface may exceed either of the following methane concentration limits:

(1) 500 ppmv, other than non-repeatable, momentary readings, as determined by instantaneous surface emissions monitoring.

(2) An "average methane concentration limit of 25 ppmv as determined by integrated surface emissions monitoring.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551, 38560, 38560.5, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95466. Construction Activities

(a) The requirements of section 95465 do not apply to the working face of the landfill or to areas of the landfill surface where the landfill cover material has been removed and refuse has been exposed for the purpose of installing, expanding, replacing, or repairing components of the landfill gas, leachate, or gas - condensate collection and removal system, or for law enforcement activities requiring excavation.

(b) Any new gas collection system components, or modifications to the existing system, must be included in the Design Plan pursuant to section 95464(a).

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550; 38551, 38560, 38560.5, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95467. Permanent Shutdown and Removal of the Gas Collection and Control System

(a) The gas collection and control system at a closed MSW landfill can be capped or removed provided the following requirements are met:

(1) The gas collection and control system was in operation for at least 15 years, unless the owner or operator can demonstrate to the satisfaction of the Executive Officer that due to declining methane rates the MSW landfill will be unable to operate the gas collection and" control system for a 15-year period.

(2) Surface methane concentration measure"ments do not exceed the limits specified in section 95465.

(3) The owner or operator submits an Equipment Removal Report to the Executive Officer pursuant to section 95470(b)(2).

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551, 38560, 38560.5, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95468. Alternative Compliance Options

(a) The owner or operator may request alternatives to the compliance measures, monitoring requirements, test methods and procedures of sections 95464, 95469, and 95471. Any alternatives requested by the owner or operator must be submitted in writing to the Executive Officer. Alternative compliance option requests may include, but are not limited to, the following:

(1) Semi-continuous operation of the gas collection and control system due to insufficient landfill gas flow rates.

(2) Additional time allowance for leak repairs for landfills having consiste'nt issues related to the procurement and delivery 'of necessary parts to complete the repair.

(3) Alternative wind speed requirements for landfills consistently having winds in excess of the limits specified in this subarticle.

(b) Criteria that the Executive Officer may use to evaluate alternative compliance option requests include, but are not limited to: compliance history; documentation containing the landfill gas flow rate and measured methane concentrations for individual gas collection wells or components; permits; component testing and surface monitoring results; gas collection and control system operation, maintenance, and inspection records; and historical meteorological data.

(c) The Executive Officer will review the requested alternatives and either approve or disapprove the alternatives within 120 days. The Executive Officer may request that additional information be submitted as part of the review of the requested alternatives.

(1) If a request for an alternative compliance option is denied, the Executive Officer will provide written reasons for the denial.

(2) The Executive Officer must deny the approval of any alternatives not providing equivalent levels of enforceability or methane emission control.

Note: Authority cited: Sections 38501; 38510, 38560, 38560.5, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551, 38560, 38560.5, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95469. Monitoring Requirements

(a) *Surface Emissions Monitoring Requirements:* Any owner or operator of a MSW landfill with a gas collection and control system must conduct instantaneous and

integrated surface monitoring of the landfill surface quarterly using the procedures specified in section 95471 (c).

(1) *Instantaneous Surface Monitoring:* Any reading exceeding the limit specified in section 95465(a)(1) must be recorded as an exceedance and the following actions must be taken:

(A) The owner or operator must record the date, location, and value of each exceedance, along with re-test dates and results. The location of each exceedance must be clearly marked and identified on a topographic map of the MSW landfill, drawn to scale with the location of both the grids and the gas collection system clearly identified.

(8) Corrective action must be taken by the owner or operator such as, but not limited to, cover maintenance or repair, or well vacuum adjustments and the location must be remonitored within ten calendar days of a measured exceedance.

1. If the re-monitoring of the location shows a second exceedance, additional corrective action must be taken and the location must be re-monitored again no later than 10 calendar days after the second exceedance.

2. If the re-monitoring shows a third exceedance, the owner or owner or operator must install a new or replacement well as determined to achieve compliance no later than 120 calendar days after detecting the third exceedance, or it is a violation of this subarticle.

(C) Any closed or inactive MSW landfill, or any closed or inactive areas on an active MSW landfill that has no monitored exceedances of the limit specified in section 95465(a)(1) after four consecutive quarterly monitoring periods may monitor annually. Any exceedances of the limits specified in section 95465(a)(1) detected during the annual monitoring that can not be remediated within 10 calendar days will result in a return to quarterly monitoring of the landfill.

(0) Any exceedances of the limit specified in section 95465(a)(1) detected during any compliance inspections will result in a return to quarterly monitoring of the landfill.

(2) *Integrated Surface Monitoring:* Any reading exceeding the limit specified in section 95465(a)(2) must be recorded as an exceedance and the following actions must be taken:

(A) The owner or operator must record the average surface concentration measured as methane for each grid along with re-test dates and results. The location of the grids and the gas collection system must be clearly marked and identified on a topographic map of the MSW landfill drawn to scale.

(B) Within 10 calendar days of a measured exceedance, corrective action must be taken by the owner or operator such as, but not limited to, cover maintenance or repair, or well vacuum adjustments and the grid must be re-monitored.

1. If the re-monitoring of the grid shows a second exceedance, additional corrective action must be taken and the location must be re-monitored again no later than 10 calendar days after the second exceedance.

2. If the re-monitoring in section 95469(a)(2)(B)1. shows a third exceedance, the owner or operator must install a new or replacement well as determined to achieve compliance no later than 120 calendar days after detecting the third. exceedance, or it is a violation of this subarticle.

(C) Any closed or inactive MSW landfill, or any closed or inactive areas on an active MSW landfill that has no monitored exceedances of the limit specified in section 95465(a)(2) after 4 consecutive quarterly monitoring periods may monitor annually. Any exceedancesof the limits specified in section 95465(a)(2) detected during the annual monitoring that can not be remediated within 10 calendar days will resultin a return to quarterly monitoring of the landfill.

(E) Any exceedances of the liiTlits specified in section 95465(a)(2). detected during any compliance inspections will result in a return to quarterly monitoring of the landfill.

(3) An owner or operator of a closed or inactive MSW landfill, or any closed or inactive areas on an active MSW landfill that can demonstrate that in the three years before the effective date of this subarticle that there were no measured exceedances of the. limits specified in section 95465 by annual or quarterly monitoring may monitor annually. Any exceedances of the limits specified in section 95465 detected during the annual monitoring that can not be remediated within 10 calendar days will result in a return to quarterly monitoring of the landfill.

(b) *Gas Control System Equipment Monitoring:* The owner or operator must monitor the gas control system using the following procedures:

(1) For enclosed flares the following equipment must be installed, calibrated, maintained, and operated according to the manufacturer's specifications:

(A) A temperature monitoring device equipped with a continuous recorder which has an accuracy of plus or minus (±) 1 percent of the temperature being measured expressed in degrees Celsius or Fahrenheit.

(8) At least one gas flow rate measuring device which must record the flow to the control device(s) at least every 15 minutes.

(2) For a gas control device other than an enclosed flare, qemonstrate compliance by providing information describing the operation of the gas control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. Alternatives to this section must be submitted as specified in section 95468. The Executive Officer may specify additional monitoring procedures.

(3) Components containing landfill gas and under positive pressure must be monitored quarterly for leaks. Any component leak must be tagged and repaired within 10 calendar days, or it is a violation of this subarticle.

(A) Component leak testing at MSW landfills having landfill gas-to-energy facilities may be conducted prior to scheduled maintenance or during planned outage periods.

(c) *Wellhead Monitoring:* The owner or operator must monitor each individual wellhead monthly to determine the gauge pressure. If there is any positive pressure reading other than as provided in sections 95464(d) and 95464(e), the owner or operator must take the following actions:

(1) Ihitiate corrective action within five calendar days of the positive pressure measurement.

(2) If the problem cannot be corrected within 15 days of the date the positive pressure was first measured, the owner or operator must initiate further action, including, but not limited to, any necessary expansion of the gas collection system, to mitigate any positive pressure readings.

(3) Corrective actions, including any expansion of the gas collection and control system, must be completed and any new wells must be operating within 120 days of the date the positive pressure was first measured, or it is a violation of this subarticle.

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600; and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551, 38560, 38560.5, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95470. Recordkeeping and Reporting Requirements.

(a) *Recordkeeping Requirements.*

(1) An owner or operator must maintain the following records for at least five years:

(A) All gas collection system downtime exceeding five ca1endar days, including individual well shutdown and disconnection times, and the reason for the downtime.

(B) All gas control system downtime in excess of one hour, the reason for the downtime, and the length of time the gas control system was shutdown.

(C) Expected gas generation flow rate calculated pursuant to section 95471 (e).

(0) Records of all instantaneous surface reading's of 200 ppmv or greater; all exceedances of the limits in sections 95464(b)(1)(B) or 95465, including the location of the leak (or affected grid), leak concentration in ppmv, date and time of measurement, the action taken to repair the leak, date of repair, any required re-monitoring and the re-monitoredconcentration in ppmv, and wind speed during surface sampling; and the installation date and location of each well installed as part of a gas collection system expansion.

(E) Records of any positive wellhead gauge pressure measurements, the date of the measurements, the well identification number, and the corrective action taken.

(F) Annual solid waste acceptance rate. and the current amount of waste-in-place.

.(G) Records of the nature, location, amount, and date of deposition of non-degradable waste for any landfill areas excluded from the collection system.

(H) Results of any source tests conducted pursuant to section .95464(b)(4).

(I) Records describing the mitigation measures taken to prevent the release of methane or other emissions into the atmosphere:

1. When solid waste was brought to the surface during the installation or preparation of wells, piping, or other equipment;

2. During repairs or the temporary shutdown of gas collection system components; or,

3. When solid waste was excavated and moved.

(J) Records of any construction activities pursuant to section 95466. The records must contain the following information:

1. A description of the actions being taken, the areas of the MSW landfill that will be affected by these actions, the reason the actions are required, and any landfill gas collection system components that will be affected by these actions.

2. Construction start and finish dates, projected equipment installation dates, and projected shut down times for individual gas collection system components.

3. A description of the mitigation measures taken to minimize methane emissions and other potential air quality impacts.

(K) Records of the equipment operating parameters specified to be monitored under sections 95469(b)(1) and 95469(b)(2) as well as records for periods of operation during which the parameter boundaries established during the most recent source test are exceeded. The records must include the following information:

1. For enclosed flares, all 3-hour periods of operation during which the average temperature difference was more than 28 degrees Celsius (or 50 degrees Fahrenheit) below the average combustion temperature during the most recent source test.at which compliance with sections 95464(b)(2) and 95464(b)(3)(A) was determined.

2. For boilers or process heaters, whenever there is a change in the location at which the vent stream is introduced into the flame zone pursuant to section .95464(b)(3)(A)2.

3. For any owner or operator who uses a boiler or process heater with a design heat input capacity of 44 megawatts (150 MM8tu/hr) or greater to comply with section 95464(b)(3), all periods of operation of the boiler or process heater (e.g., steam use, fuel use, or monitoring data collected pursuant to other federal, State, local, or tribal regulatory requirements).

(2) The owner or operator must maintain the following records for the life of each gas control device, as measured during the initial source test or compliance determination:

(A) The control device vendor specifications.

(8) The expected gas generation flow rate as calculated pursuant to section 95471 (e).

(C) The percent reduction of methane achieved by the control device determined pursuant to section 95471 *(t).*

(0) For a boiler or process heater, the description of the location at which the collected gas ventstream is introduced into the boiler or process heater over the same time period of the performance test.

(E) For an open flare: the flare type (i.e., steam-assisted, air-assisted, or non-assisted); all visible emission readings, heat content determination, flow rate or bypass flow rate measurements, and exit velocity determinations made during the performance test as specified in CFR 4060.18 (as last amended 65 Fed.Reg. 61752 (October 17,2000), which is incorporated by reference herein; and records of the flare pilot flame or flare flame monitoring and records of all periods of operations during which the pilot .f1ame or the flare flame is absent.

(3) Record Storage: The owner or operator must maintain copies of the records and reports required by this subarticle and provide them to the Executive Officer within five business days upon request. Records and reports must be kept at a location within the State of California.

(b) *Reporting Requirements.*

(1) Closure Notification: Any owner or operator of a MSW landfill which has ceased accepting waste must submit a Closure Notification to the Executive Officer within 30 days of waste acceptance cessation.

(A) The Closure Notification must include the last day solid waste was accepted, the anticipated closure date of the MSW landfill, and the estimated waste-in-place.

(8) The Executive Officer may request additional information as necessary to verify that permanent closure has taken place in accordance with the requirements of any applicable federal, State, local, or tribal statues, regulations, and .ordinances in effect at the time of closure.

(2) Equipment Removal Report: A gas collection and control system Equipment Removal Report must be submitted to the Executive Officer 30 days prior to well capping, removal or cessation of operation of the gas collection, treatment, or control system equipment. The report must contain all of the following information:

(A) A copy of the Closure Notification submitted pursuant to section 95470(b)(1).

(8) A copy of the initial source test report or other documentation demonstrating that the gas collection and control system has been installed and operated for a minimum of 15 years, unless the owner or operator can demonstrate to the satisfaction of the Executive Officer that due to declining methane rates the landfill is unable to operate the gas collection and control system for a 15-year period.

(C) Surface emissions monitoring results needed to verify that landfill surface methane concentration measurements do hot exceed the limits specified in section 95465.

(3) Annual Report: Any owner or operator subject to the .requirements of this suparticle, except section 95463, must prepare an annual report for the period of January 1 through December 31 of each year. Each subsequent annual report must be submitted to the Executive Officer by March 15 of the following year. The annual report must contain the following information:

(A) MSW landfill name, owner and operator, address, and solid waste information system (SWIS) identification number.

(8) Total volume of landfill gas collected (reported in standard cubic feet).

(C) Average composition of the landfill gas collected over the .reporting period (reported in percent methane and percent carbon dioxide by volume).

(0) Gas control device type, year of installation, rating, fuel type, and total amount of landfill gas combusted in each control device.

(E) The date that the gas collection and control system was installed and in full operation.

(F) The percent methane destruction efficiency of each gas control device(s).

(G) Type and amount of supplemental fuels burned with the landfill gas in each device.

(H) Total volume of landfill gas shipped off-site, the composition of the landfill gas collected (reported in percent methane and percent carbon dioxide by volume), and the recipient of the gas.

(I) Most recent topographic map of the site showing the areas with final cover and a geomembrane and the areas with final cover without a geomembrane with corresponding percentages over the landfill surface.

(J) The information required by sections 95470(a)(1)(A), 95470(a)(1)(8), 95470(a)(1)(C), 95470(a}(1)(0), 95470(a)(1)(E), and 95470(a)(1)(F), 95470(a)(1)(H), and 95470(a)(1)(K).

(4) Waste-in-Place Report: Any owner or operator subject to the requirements of sections 95463(a), or 95643(b)(2)(8) must report the following information to the Executive Officer:

(A) MSW landfill name, owner and operator, address, and solid waste information system (SWIS) identification number.

(8) The landfill's status (active, closed, or inactive) and the estimated waste-in-place, in tons.

(C) Most recent topographic map of the site showing the areas with final cover and a geomembrane and the areas with final cover without a geomembrane with corresponding percentages over the landfill surface.

(5) Landfill Gas *Heat Input Capacity Report:* Any owner or operator subject to the requirements of section 95463(b) must calculate the landfill gas heat input capacity using the calculation procedures specified in section 95471(b) and report the results to the Executive Officer within 90 days of the effective date of this subarticle or upon reaching

450,000 tons of waste-in-place. The calculation, along with relevant parameters, must be provided as part of the report.

(6) Any report, or information submitted pursuant to this subarticle must contain certification by a responsible official of truth, accuracy, and completeness. This certification, and any other certification required under this subarticle, must state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551, 38560, 38560.5, 39003, 39500,39600, and 39601, Health and Safety Code.

§ 95471. Test Methods and Procedures

(a) *Hydrocarbon Detector Specifications:* Any instrument used for the measurement of methane must be a gas detector or other equivalent instrument approved by the Executive Officer that meets the calibration, specifications, and performance criteria of EPA Reference Method 21, Determination of Volatile Organic Compound Leaks, 40 CFR Part 60, Appendix A (as last amended 65 Fed.Reg. 61744 (October 17, 2000)), which is incorporated by reference herein, except for the following:

(1) "Methane" replaces all references to volatile organic compounds (VOC).

(2) The calibration gas shall be methane.

(b) *Determination of Landfill Gas Heat Input Capacity:* The landfill gas heat input capacity must be determined pursuant to sections 95471(b)(1), 95471 (b)(2), or 95471 (b)(3), as applicable:

(1) MSW Landfills without Carbon Adsorption or Passive Venting Systems: The heat input capacity must be calculated using the procedure as specified in Appendix I. The Executive Officer may request additional information as may be necessary to verify the heat input capacity from the MSW landfill. Site-specific data may be substituted when available..

(2) MSW Landfills with Carbon Adsorption Systems: The landfill gas heat capacity must be determined by measuring the actual total landfill gas flow rate, in standard cubic feet per minute (scfm), using a flow meter or other flow measuring device such as a standard pitot tube and methane concentration (percent by volume) using a hydrocarbon detector meeting the requirements of 95471 (a). The total landfill gas flow rate must be multiplied by the methane concentration and then multiplied by the gross heating value (GHV) of methane of 1,012 Btu/scf to determine the landfill gas heat input capacity.

(3) *MSW Landfills with Passive Venting Systems:* The landfill gas heat input capacity must be determined pursuant to both of the following and is the higher of those determined values:

(A) Section 95471(b)(1); and

(B) The owner or operator must measure actual landfill gas flow rates (in units of scfm) by using a flow measuring device such as a standard pitot tube and methane concentration (percent by volume) using a hydrocarbon detector meeting the requirements of 95471(a) from each venting pipe that is within the waste mass. Each gas flow rate must then be multiplied by its corresponding methane concentration to obtain the individual methane flow rate. The individual methane flow rates must be added together and then multiplied by the GHV of methane of 1,012 Btu/scf to determine the landfill gas heat input capacity.

(c) *Surface Emissions Monitoring Procedures:* The owner or operator must measure the landfill surface concentration of methane using a hydrocarbon detector meeting the requirements of section 95471(a). The landfill surface must be inspected using the following procedures:

(1) *Monito;ing Area:* The entire landfill surface must be divided into individually identified 50,000 square foot grids. The grids must be used for both instantaneous and integrated surface emissions monitoring.

(A) Testing must be performed by holding the hydrocarbon detector's probe within 3 inches of the landfill surface while traversing the grid.

(B) The walking pattern must be no more than a 25-foot spacing interval and must traverse each monitoring grid.

1. If the owner or operator has no exceedances of the limits specified in section 95465 after any four consecutive quarterly monitoring periods, the walking pattern spacing may be increased to 1DO-foot intervals. The owner or operator must return to a 25-foot spacing interval upon any exceedances of the limits specified in section 95465 that cannot be remediated within 10 calendar days or upon any exceedances detected during a compliance inspection.

2: An owner or operator of a MSW landfill can demonstrate that in the past three years before the effective date of this subarticle that there were no measured exceedances of the limits specified in section 95465 by annual or quarterly monitoring may increase the walking pattern spacing to

1DO-foot intervals. The owner or operator must return to a 25-foot spacing interval upon any exceedances of the limits specified in section 95465 that cannot be remediated within 10 'calendar days or upon any exceedances detected during a compliance inspection.

(C) Portions of slopes that are 30 degrees and greater, wet or icy surfaces, construction areas, and other dangerous areas may be excluded from landfill surface inspection. Paved roads that do not have any cracks, pot holes, or other penetrations may also be excluded.

(0) Surface testing must be terminated when the average wind speed exceeds five miles per hour or the instantaneous wind speed exceeds 10 miles per hour. The Executive Officer may approve alternatives to this wind speed surface testing termination for MSW landfills consistently having measured winds in excess of these specified limits. Average wind speed must be determined on a 15-minute average using an on-site anemometer with a continuous recorder for the entire duration of the monitoring event.

(E) Surface emissions testing must be conducted only when there has been no measurable precipitation in the preceding 72 hours.

(2) Instantaneous Surface Emissions Monitoring Procedures.

(A) The owner or operator must record any instantaneous surface readings of methane 200 ppmv or greater, other than non-repeatable, momentary readings.

(8) Surface areas of the MSW landfill that exceed a methane concentration limit of 500 ppmv must be marked and remediated pursuant to section 95469(a)(1).

(C) The wind speed must be recorded during the sampling period.

(0) The landfill surface areas with cover penetrations, distressed' vegetation, cracks or seeps must also be inspected visually and with a hydrocarbon detector.

(3) Integrated Surface Emi$sions Monitoring Procedures.

(A) Integrated surface readings must be recorded and then averaged for each grid.

(B) Individual monitoring grids that exceed an average methane concentration of 25 ppmv must be identified and remediated pursuant to section 95469(a)(2).

(C) The wind speed must be recorded during the sampling period.

(d) *Gas Collection and Control System Leak Inspection Procedures.* Leaks must be measured using a hydrocarbon detector meeting the requirements of 95471 (a).

(e) *Determination of Expected Gas Generation Flow Rate.* The expected gas generation flow rate must be determined as prescribed in the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Chapter 3, which is incorporated by reference herein, using a recovery rate of 75 percent.

(f) *Control Device Destruction Efficiency Determination.* The following methods of analysis must be used to determine the efficiency of the control device in reducing methane:

(1) Enclosed Combustors: One of the following test methods, all of which are incorporated by reference herein (and all as promulgated in 40 CFR, part 60, Appendix A, as last amended 65 Fed.Reg. 61744 (October 17, 2000», must be used to determine the efficiency of the control device in reducing methane by at least 99 percent, or in reducing the outlet methane concentration for lean burn engines to less than 3,000 ppmv, dry basis, corrected to 15 percent oxygen:

U.S. EPA Reference Method 18, Measurement of Gaseous Organic Compound Emissions By Gas Chromatography;

U.S. EPA Reference Method 25, Determination of Total Gaseous Nonmethane Organic Emissions as Carbon;

U.S. EPA Reference Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer; or

U.S. EPA Reference Method 25C, Determination of Nonmethane Organic Compounds in Landfill Gases.

The following equation must be used to calculate destruction efficiency:

$$Destruction\ Efficiency = \left[1 - \frac{(Mass.\ of\ Methane.\ -Outlet J]}{Mass\ of\ Methane\ -\ Inlet}\right] \times 100\%$$

(2) Open Flares: Open flares must meet the requirements of 40 CFR 60.18 (as last amended 65 Fed.Reg. 61752 (October 17, 2000).

(g) *Determination* of *Gauge' Pressure.* Gauge pressure must be determined using a hand-held manometer, magnahelic gauge, or other pressure measuring device approved by the Executive Officer. The device must be calibrated and operated in accordance with the manufacture's specifications.

(h) *Alternative Test Methods.* Alternative test methods may be used provided that they are approved in writing by the Executive Officer.

Note: Authoritycited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,.38505,38510,38550, 38551, 38560, 38560.5, 39003, 39500, 39600, and 39601, Health arid Safety Code.

§ 95472. Penalties

(a) Penalties may be assessed for any violation of this subarticle pursuant to Health and Safety Code section 38580. Each day during any portion of which a violation occurs is a separate offense.

(b) Any violation of this subarticle may be enjoined pursuant to Health and Safety Code section 41513.

(c) Each day or portion thereof that any report, plan, or document required by this subarticle remains unsubmitted, is submitted late, or contains incomplete or inaccurate information,' shall constitute a single, separate violation of this subarticle.

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551,38560,38560.5,39003,39500,39600, and 39601, Health and Safety Code.

§ 95473. Implementation, Enforcement, and Related Fees

The Executive Officer, at his or her discretion, may enter into an agreement with a District to implement and enforce this subarticle. Pursuant to this agreement, an owner or operator of a MSW landfill must pay any fees assessed by a District for the purpose of recovering the District's cost of implementing and enforcing the requirements of this subarticle.

Note: Authority cited: Sections 38501, 38510, 38560, 38560.5, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551, .38560, 38560.5, 39003, 39500, 39600, 39601, and 40001 (a), Health and Safety Code.

§ 95474. Applicabiiity of Other Rules and Regulations .

Compliance with this regulation does not exempt a person from complying with other federal, State, or local law, including but not limited to, California Health and Safety Code Section 41700; rules pertaining to visible emissions, nuisance, or fugitive dust, or from permitting requirements of a District, the Regional Water Quality Control Board, local enforcement agencies, the Integrated Waste Management Board, and other local,' State, and federal agencies.

§ 95475. Definitions

(a) For purposes of this subarticle, the following definitions apply:

(1) "Active MSW Landfill" means a MSW landfill that is accepting solid waste for disposal.

(2) "Component Leak" means the concentration of methane measured one half of an inch or less from a component source that exceeds 500 parts per million by volume (ppmv), other than non-repeatable, momentary readings. Measurements from any vault must be taken within 3 inches above the surface of the vault exposed to the atmosphere.

(3) "Component" means any equipment that is part of the gas collection and control system and that contains landfill gas including, but not limited to, wells, pipes, flanges, fittings, valves, flame arrestors, knock-out drums, sampling ports, blowers, compressors, or connectors.

(4) "Construction and Demolition Wastes" means waste building materials, packaging and rubble resulting from construction, remodeling, repair and demolition operations on pavements, houses, commercial buildings and other structures.

(5) "Continuous Operation" means that the gas collection and control system is operated continuously, the existing gas collection wells are operating under vacuum while maintaining landfill gas flow, and the collected landfill gas is processed by a gas control system 24 hours per day.

(6) "Closed MSW Landfill" means that a MSW landfill is no longer accepting solid waste for disposal and has documentation that the closure was conducted in accordance with the applicable statutes, regulations, and local ordinances in effect at the time of closure, or can document that the landfill is no longer receiving solid waste.

(7) "District" means any air quality management district or air pollution control district in the State of California. .

(8) "Destruction Efficiency" means a measure of the ability of a gas control. device to combust, transform, or otherwise prevent emissions of methane from entering the atmosphere.

(9) "Enclosed Combustor" means an enclosed flare, steam generating boiler, internal combustion engine, or gas turbine.

(10) "Energy Recovery Device" means any combustion device that uses landfill gas to recover energy in the form of steam or electricity, including, but not limited to, gas turbines, internal combustion engines, boilers, and boiler-to-steam turbine systems.

(11) "Exceedance" means the concentration of methane measured within' 3 inches above the landfill surface that exceeds 500 ppmv, other than non-repeatable, momentary readings, as determined by instantaneous surface emissions monitoring; or the average methane concentration measurements exeeed 25 ppmv, as determined by integrated surface emissions monitoring.

(12) . "Executive Officer" means the Executive Officer of the Air Resources Board, or his or her delegate.

(13) "Facility Boundary" means the boundary surrounding the entire area on which MSW landfill activities occur and are permitted.

(14) "Gas Control Device" means any device used to dispose of or treat collected landfill gas,' including, but not limited to, enclosed flares, internal combustion engines, boilers and boiler-to-steam turbine systems, fuel cells, and gas turbines.

(15) "Gas Collection System" means any system that employs various gas collection wells and connected piping, and mechanical blowers, fans, pumps, or compressors to create a pressure gradient and actively extract landfill gas.

(16) "Gas Control System" means any system that disposes of or treats collected landfill gas by one or more of the following means: combustion, gas treatment for subsequent sale, or sale for processing offsite, including for transportation fuel and injection into the natural gas pipeline.

(17) "Inactive MSW Landfill" means a MSW landfill that is no longer accepting solid waste for disposal.

(18) "Landfill Gas" means any untreated, raw gas derived through a natural process from the decomposition of organic waste deposited in a MSW

landfill, from the evolution of volatile species in the waste, or from chemical reactions of substances in the waste.

(19) "Landfill Surface" means the area of the landfill under which decomposable solid waste has been placed, excluding the working face.

(20) "Municipal Solid Waste Landfill" or "MSW Landfill" means an entire disposal facility in a contiguous geographical space where solid waste is placed in or on land.

(21) "Non-decomposable Solid Waste" means materials that do not degrade biologically to form landfill gas. Examples include, but are not limited to, earth, rock, concrete asphalt paving fragments, clay products, inert slag, asbestos-containing waste, and demolition materials containing minor amounts (less than 10 percent by volume) of wood and metals. Materials that do not meet this definition are considered decomposable solid waste.

(22) "Non-repeatable, Momentary Readings" means indications of the presence of methane, which persist for less than five seconds and do not recur when the sampling probe of a portable gas detector is placed in the same location.

(23) "Operator" means any person or entity, including but not limited to any government entity, corporation, partnership, trustee, other legal entity, or individual that:

(A) Operates the MSW landfill;

(B) Is responsible for complying with any federal, state, or local requirements relating to methane emissions from real property used for MSWlandfill purposes and subject to this subarticle;

(C) Operates any stationary equipment for the collection of landfill gas;

(0) Purchases landfill gas from an owner or operator of a MSW landfill and operates any stationary equipment for the treatment of landfill gas; or

(E) Purchases untreated landfill gas from an owner or operator of a MSW landfill and operates any stationary equipment for the combustion of landfill gas.

(24) "Owner" means any person or entity, including but not limited to any government entity, corporation, partnership, trustee, other legal entity, or individual that:

(A) Holds title to the real property on which the MSW landfill is located, including but not limited to title held by joint tenancy, tenancy in

common, community property, life estate, estate for years, lease, sublease, or assignment, except title held solely as security for a debt such as mortgage;

(B) Is responsible for complying with any federal, state, or local requirements relating to methane emissions from real property used for MSW landfill purposes and subject to this subarticle.

(C) Owns any stationary equipment for the collection of landfill gas;

(0) Purchases the landfill gas from an owner or operator of a MSW landfill and owns any stationary equipment for the treatment of landfill gas; or

(E) Purchases untreated landfill gas from an owner or operator of a MSW landfill and owns any stationary equipment for the combustion of landfill gas.

(25) "Perimeter" means along the MSW landfill's permitted facility boundary.

(26) "Professional Engineer" means an engineer holding a valid certificate issued by the State of California Board of Registration for Professional Engineers and Land Surveyors or a state offering reciprocity with California.

(27) "Solid Waste" means all decomposable and non-decomposable solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial waste, manure, vegetable or animal solid and semisolid wastes, sludge, and other discarded solid and semisolid wastes. Solid waste also includes any material meeting the definition of Solid Waste in 40 CFR 60.751 (as last amended 64 Fed.Reg 9262, Feb 24, 1999) as incorporated by reference herein.

(28) "Subsurface Gas Migration" means underground landfill gases that are detected at any point on the perimeter pursuant to California Code of Regulations Title 27, section 20921.

(29) "Waste-in-Place" means the total amount of solid waste placed in the MSW landfill estimated in tons. The refuse density is assumed to be 1,300 pounds per cubic yard and the decomposable fraction is assumed to be 70 percent by weight.

(30) "Well Raising" means a MSW landfill activity where an existing gas collection well is temporarily disconnected from a vacuum source, and the non-perforated pipe attached to the well is extended vertically to allow the addition of a new layer of solid waste or the final cover; or is extended

horizontally to allow the horizontal extension of an existing layer of solid waste or cover material. The extended pipe (well extension) is then re-connected in order to continue collecting gas from that well.

(31) "Working Face" means the open area where solid waste is deposited daily and compacted with landfill equipment.

Note: Authority cited: Sectiohs 38501,38510; 38560, 38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550, 38551; 38560, 38560.5, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95476. Severability

Each part of this subarticle is deemed severable, and in the event that any part of this subarticle is held to be invalid, the remainder of this subarticle continues in full force and effect.

Note: Authority cited: Sections 38501,38510,38560,38560.5,38580,39600, and 39601, Health and Safety Code. Reference: Sections 38501 ,38505,38510,38550, 38551,38560,38560.5,39003,39500,39600, and 39601, Health and Safety Code.

APPENDIX I

1.0 Calculate Heat Input.Capacity

Heat Input Capacity (MMBtu/hr) = Methane Gas Generation (scfm) x 60 minutes/1 hour x Collection Efficiency x GHV x 1 MMBtu/1,000,000 Btu

Where:

Collection Efficiency = the landfill gas collection efficiency in percent (%), which is 75 percent.

GHV (Gross Heating Value) = Gross heating value of methane, which is 1,012 in units of British thermal units per standard cubic feet, or Btu/scf; source: http://epa.gov/lmop/res/converter.htm).

2.0 Methane Gas Generation: CH_4 Generation is calculated using the following equation:

$$CH_4 \text{ Generation (Mg of } CH_4) = (ANDOC_{year\text{-}start} \times [1 - e^{-lk})] - ANDOC_{deposited\text{-}lastyear} \times [11k \times (e^{-1kX\ (1\text{-}MI12))} - e^{-[k])} - (M/12) \times e\text{-}[k]] + ANDOC_{deposited\text{-}same\ year} \times [1\text{-}((11k) \times (1 - e^{-1kx\ (1\text{-}M12)}) + (M/12))]J \times FCH_4$$

Where:

CH_4 Generation = CH_4 generated in the inventory year in question (Mg of CH_4) using the Mathematically Exact First-Order Decay Model provided in the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Chapter 3 (Source: http://www.ipcc-nggip.iges.or.jp/public/2006gllpdf/5 Volume5N5 3 Ch3 SWDS.pdf).

FCH_4 = Fraction of decomposing carbon converted into CH_4 (Default = 0.5)

$ANDOC_{year\text{-}start}$ = ANDOC in place at the beginning of the inventory year in question

$ANDOC_{deposited\text{-}last\ year}$ = ANDOC deposited during the previous inventory year

$ANDOC_{deposited\text{-}same\ year}$ = ANDOC deposited during the inventory year in question

3.0 To Convert Methane Generated from Mg of CH_4 to SCFM

CH_4 Gas Generated (scfm) = CH_4 Generation (Mg/year) x 1 year/525,600 minutes x 1,000,000 g/Mg x 1 mole CH.116.04246 g CH4 x 0.83662 SCF/mole landfill gas

4.0 Define ANDOC%

ANDOC% = Σ WIPFRACj x TDOC; x DANF;
Where:

WIPFRACi = Fraction of the i^{th} component in the waste-in-place

TDOCi = Total Degradable Organic Carbon fraction of the ith waste component (Mg of that componentlMg of Total, waste-in-place

DANFi = Decomposable .Anaerobic Fraction of the i^{th} waste component, that fraction capable of decomposition in anaerobic conditions (Mg of decomposable carbon for that componentlMg TDOCi for that component)

5.0 Define ANDOC

ANDOC = WIP (Tons) x 0.9072 (MglTon) x ANDOC%

Where:

ANDoe = Anaerobically Degradable Organic Carbon, carbon that is capable of decomposition in an anaerobic environment (Mg of carbon)

WIP = Waste-in-Place estimate of all the landfilled waste (wet weight) as reported to the CIWMB (tons)

Where:

ANDOCyear-end = AN DOC remaining undecomposed at the end of the inventory year in question

$ANDOC_{year\text{-}start}$ = ANDOC in place at the beginning of the inventory year in question

$ANDOC_{deposited\text{-}last\ year}$ = ANDOC deposited during the previous inventory year

$ANDOC_{deposited\text{-}same\ year}$ = ANDOC deposited during the inventory year in question

M = Assumed delay before newly deposited waste begins to undergo anaerobic decomposition (Months, Default = 6)

k = Assumed rate constant for anaerobic decomposition; k = ln2/half-life (years); half-life is the number of years required for half of the original mass of carbon to degrade

The following values for the assumed rate constant for anaerobic decomposition (or "k") must be used:

Table 1. Average Rainfall and k Values

Average Rainfall (InchesNear)	k Value
<20	0.020
20-40	0.038
>40	0.057

Source. U.S. EPA
http//ww.ncgc.nrcs.usda.gov/products/datasets/climate/data/precipitation-state/ca.html.

The following waste characterization default values shown in Tables 1A, 1H, 2, and 3 in addition to the model equations must be used in estimating the methane generation potential for a MSW landfill:

Table 1A **Waste Type (%) by Year**

Waste Type	Up to 1964	1965-1974	1975-1984	1985-1992	1993-1995
Newspaper	6.4%	6.4%	5.9%	4.8%	3.9%
Office Paper	10.7%	11.3%	12.0%	13.1%	15.0%
Corrugated Boxes	10.8%	13.5%	11.5%	10.5%	10.3%
Coated Paper	2.2%	2.0%	2.4%	2.1%	1.8%
Food	14.8%	11.3%	9.5%	12.1%	13.4%
Grass	12.1%	10.3%	10.1%	9.0%	6.6%
Leaves	6.1%	5.1%	5.0%	4.5%	3.3%
Branches	6.1%	5.1%	5.0%	4.5%	3.3%
Lumber	3.7%	3.3%	5.1%	7.0%	7.3%
Textiles	2.1%	1.8%	1.7%	3.3%	4.5%
Diapers	0.1%	0.3%	1.4%	1.6%	1.9%
Construction/Demolition	2.6%	2.5%	3.5%	3.9%	4.5%
Medical Waste	0.0%	0.0%	0.0%	0.0%	0.0%
Sludge/Manure	0.0%	0.0%	0.0%	0.0%	0.0%

Source: US EPA Municipal Solid Waste publication: http://www.epa.gov/msw/pubs/03data.pdf.

Table 18	Waste Type (%) by Year	
Waste Type	**1996-2002[1]**	**2003-present[2]**
Newspaper	4.3%	2.2%
Office Paper	4.4%	2.0%
Corrugated Boxes	4.6%	5.7%
Coated Paper	16.9%	11.1%
Food	15.7%	14.6%
Grass	5.3%	2.8%
Leaves	2.6%	1.4%
Branches	2.4%	2.6%
Lumber	4.9%	9.6%
Textiles	2.1%	4.4%
Diapers	6.9%	4.4%
Construction/Demolition	6.7%	12.1%
Medical Waste	0.0%	0.0%
Sludge/Manure	0.1%	0.1%

Source:
1CIWMB Statewide Waste Characterization Study (1999).
2C1WMB Statewide Waste Characterization Study (2004).

Table 2		
Waste Type	**TOOC**	**Source**
Newspaper	46.5%	EPA
Office Paper	39.8%	EPA
Corrugated Boxes	40.5%	EPA
Coated Paper	40.5%	EPA
Food	11.7%	EPA
Grass	19.2%	EPA
Leaves	47.8%	EPA
Branches	27.9%	EPA
Lumber	43.0%	IPCC
Textiles	24.0%	IPCC
Diapers	24.0%	IPCC
Construction/Demolition	4.0%	IPCC
Medical Waste	15.0%	IPCC
Sludge/Manure	5.0%	IPCC

Sources
EPA *Solid Waste Management and Greenhouse* Gasses: *A Ufe-Cycle Assessment* of Emissions *and Sinks,* Exhibits 7-2, 7-3 (May 2002).
IPCC *Guidelines for National Greenhouse* Gas *Inventories,* Chapter 2, Table 2.4,2.5 and 2.6 (2006).

Table 3

Waste Type	DANF	Source
Newspaper	16.1%	EPA
Office Paper	87.4%	EPA
Corrugated Boxes	38.3%	EPA
Coated Paper	21.0%	EPA
Food	82.8%	EPA
Grass	32.2%	EPA
Leaves	10.0%	EPA
Branches	17.6%	EPA
Lumber	23.3%	CEC
Textiles	50.0%	IPCC
Diapers	50.0%	IPCC
Construction/Demolition	50.0%	IPCC
Medical Waste	50.0%	IPCC
Sludge/Manure	50.0%	IPCC

Sources:
EPA *Solid Waste Management and Greenhouse Gasses: A Life-Cycle Assessment of Emissions and Sinks* Exhibits 7-2, 7-3 (May 2002).
CEC *Inventory of Califomia Greenhouse Gas Emissions and Sinks: 1990-2004* (December 2006).
IPCC *Guidelines Ior National Greenhouse GasInventories,* Chapter 3,3.13 (2006).

Appendix B

Flowchart for Determining Control Requirements

Figure 1. Flow Chart for Determining Control Requirements

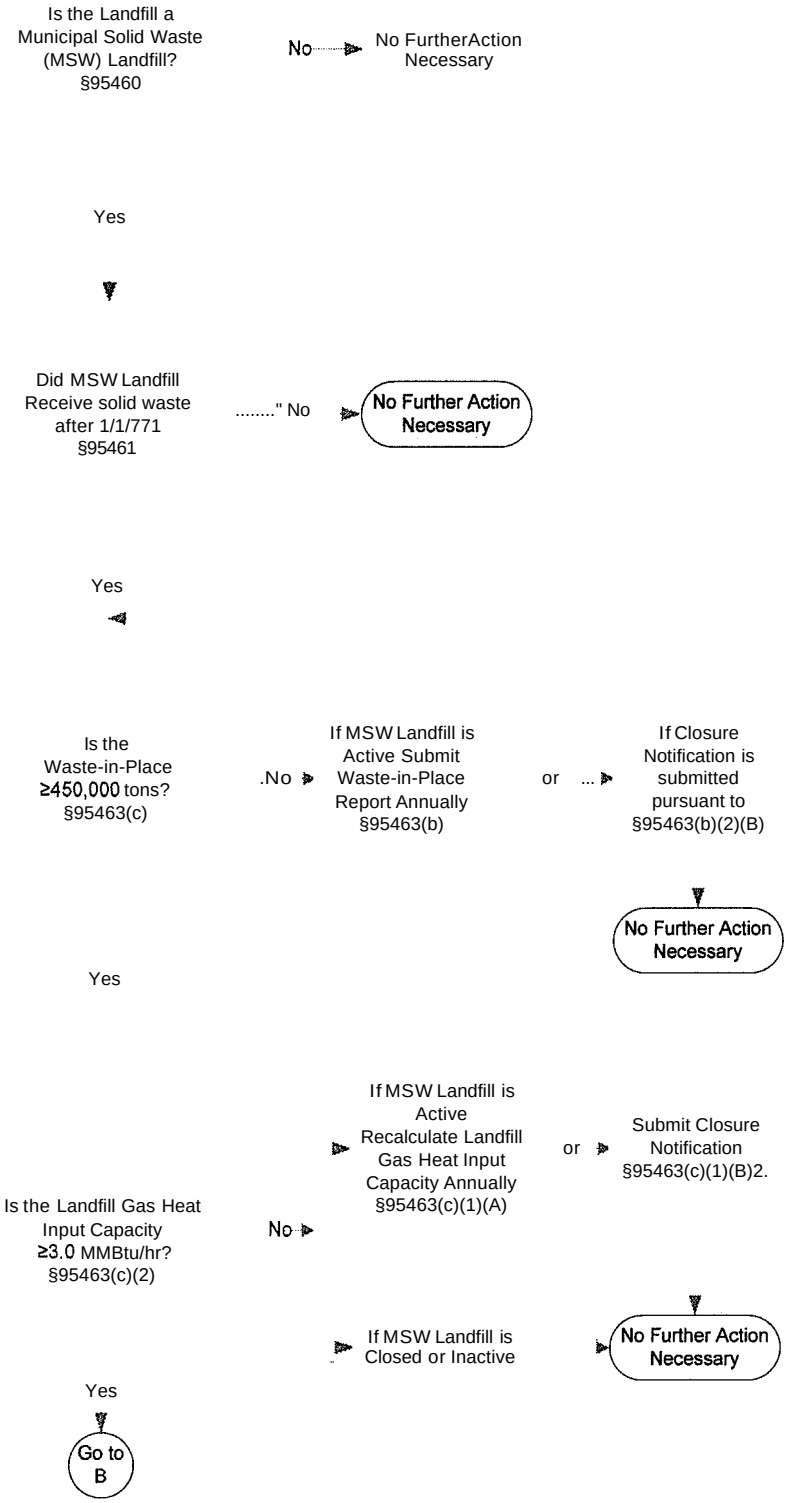
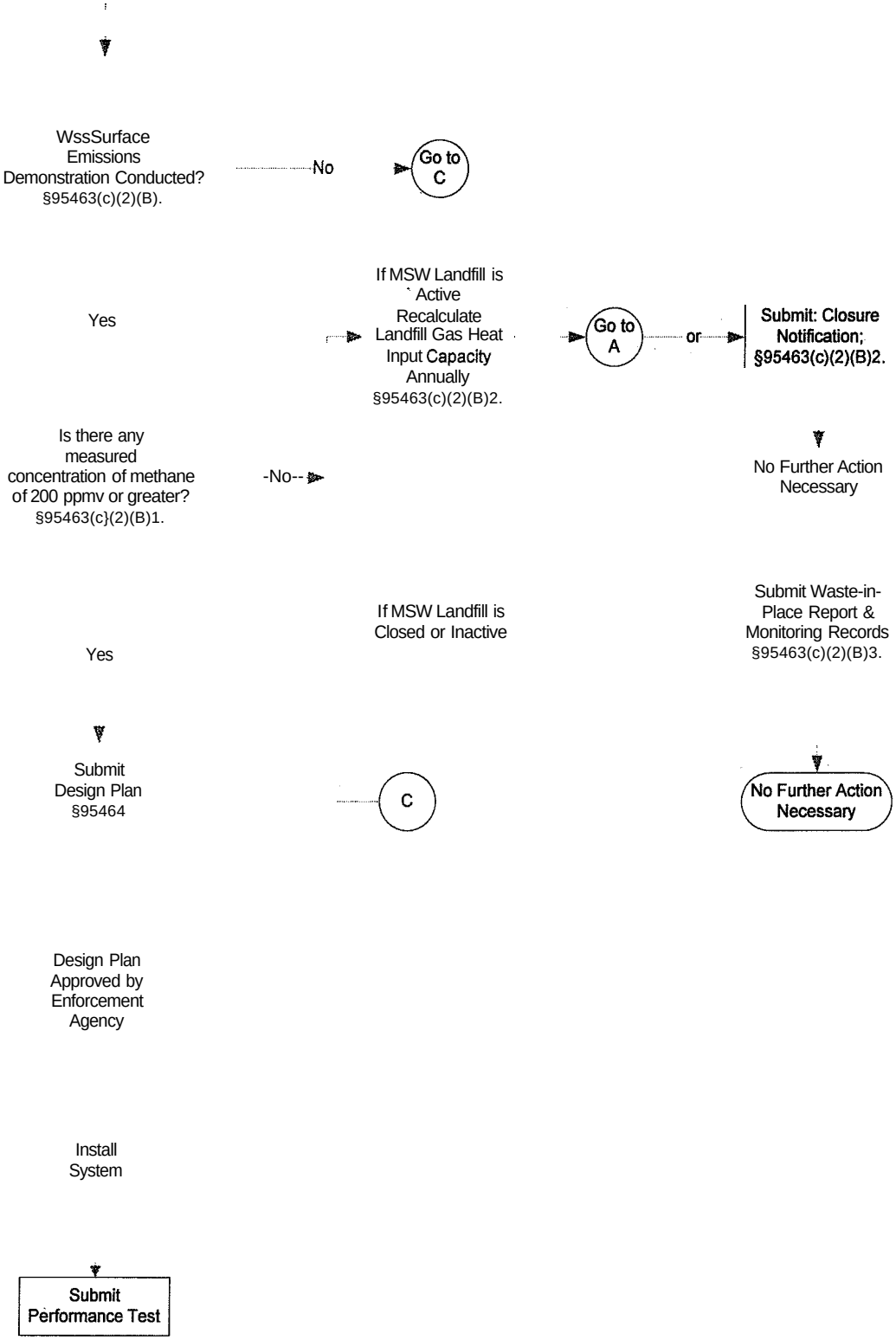


Figure 1. Flow Chart for Determining Control Requirements (Cont.)



Appendix C

Landfill Methane Emissions Methodology

Appendix C

Landfill Methane Emissions Methodology

I. Waste

A. Landfills (IPCC 4A1)

1. Background

Landfills are sites for solid waste disposal in which refuse is buried between layers of dirt so as to fill in or reclaim low-lying ground or excavated pits; they are the oldest form of waste treatment. There are numerous types of landfills accepting different types of waste. The GHG inventory is concerned only with landfills that contain and/or receive .biodegradable, carbon-bearing waste. The California Integrated Waste Management Board (CIWMB) has identified 372 such landfills in the State. Most of the waste contained in these landfills (94 percent) is currently under some form of control that reduces the emissions of methane, the principal GHG pollutant generated by ·landfills.

Landfilled carbon-bearing waste degrades mainly through anaerobic biodegradation. In an anaerobic environment (Le., without oxygen from the air), water (H20) is the source of oxygen (0) for oxidation and becomes the limiting reactant for biodegradation. The water content of a landfill determines how fast the waste degrades. If water is not available, the waste does not degrade. This anaerobic biodegradation pr.ocess generates approximately equal amounts of CO_2 and CH_4 gas as a byproduct:

Equation 1: *Anaerobic biodegradation process*

$$2C + 2H_20 \rightarrow CO_2 + CH_4$$

A large fraction (57 percent to 66 percent) of the waste will not degrade under these anaerobic conditions and the carbon it contains is effectively sequestered. This carbon will remain sequestered as long as the landfill's anaerobic conditions persist.

The various gases produced as the waste degrades are collectively called "landfill gas". Landfill gas is an odor nuisance, a source of air toxics and may even be a physical danger to those living near a landfill because the methane it contains is combustible. For these reasons, most landfills in the State (holding over 95% percent) of the waste) are equipped with a gas collection system. However, although those collection systems are designed to collect landfill gas, it is known that a portion of the gas does escape into the atmosphere.

Once collected, landfill gas can simply be vented tothe air if the only reason for the collection was to address offsite gas migration issues. Alternatively, the collected landfill gas may be stripped of its non-methane components via carbon adsorption, which main purpose is to reduce odors and/or volatile organic compounds (VOC) and toxics. Carbon adsorption allows most (99 percent) of the CH_4 to escape. Most commonly, the collected landfill gas is combusted, either in a flare (to destroy odors and VOC and toxic components in the gas, or in an engine or turbine to generate electricity.

2. Methodology

ARB staff requested site-specific landfill gas collection data through landfill surveys, but received answers for only certain years and for less than half of the landfilled waste (e.g., approximately 42 percent in 2005). Therefore, staff opted to use a model to estimate landfill emissions for all sites, and used the survey data to supplement these predictions where available.

Staff used the Mathematically Exact First-Order Decay (FOD) model from the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines (IPCC, 2006b). In summary, this model assumes that a fixed fraction of the waste available at any moment will degrade. The amount that degrades over a given amount of time is determined by a factor *(k),* which is tied to the moisture content in the landfill. The *k* values used in the model were obtained from USEPA and are function of the annual.precipitation occurring at each landfill; rainfall being used as a surrogate for landfill moisture content. The model assumes that the waste carbon is biodegraded into equal amounts of CO_2 and CH_4 (see Equation 1).

2.1 Model Equations

The inputs to the model are the amount of anaerobically degradable organic carbon (ANDOC), the delay in months before waste begins to decay anaerobically *(M),* the rate at which waste decays *(k),* and the fraction of degraded carbon that is converted into CH_4 *(FCH4).* Of these four inputs, three are set by using default values: a six month default for M, a 50 percent default for *FCH4* and USEPA defaults based on rainfall levels for *k.* Only *ANDOC* requires a more detailed method of derivation, which is the focus equation 1 below. The inputs for calculating *ANDOC* are therefore important determinants of landfill emissions estimates.

Where,

ANDOC	= Anaerobically Degradable Organic Carbon: the amount of waste carbon that is biodegradable in an anaerobic environment (Mg (Le., 10^6 grams) of carbon)
WIP	= Waste-in-Place: the landfilled waste (wet weight) as reported to the California Integrated Waste Management Board (tons)
0.9072	=Short ton to Mg (a.k.a. tonne or metric ton) conversion
FWcomponent	= Fraction of a given waste component in the landfilled waste
DOCcomponent	= Degradable Organic Carbon (DOC) content of the given waste component.
DANFcomponent	= Decomposable Anaerobic Fraction (DANF) of the given waste component.

With,

Component	= [Newspaper, Office Paper, Corrugated Boxes, Coated Paper, Food, Grass, Leaves, Branches, Lumber, Textiles, Diapers, Construction/Demolition, Medical Waste, Sludge/Manure]

(aj) *Waste-In-Place (WIP)*

The California Integrated Waste Management Bo'ard (CIWMB) staff provided ARB staff with Waste-in-Place *(WIP)* data in two basic forms: 1) the cumulative amount of waste deposited, by la.ndfill, up to the year 1990an.d, 2) the amounts deposited, by landfill, each year from 1991 to 2005 for those landfills still receiving waste after 1990. CIWMB staff also furnished the amounts of green waste and sludge used as daily cover by each landfill from 1995 to 2005. CIMWB staff provided data on 372 landfills known to contain waste that is biodegradable. Landfills containing only inert waste, like ash and masonry from demolition sites, were excluded. ARB staff also received survey data from 30 of these landfills (comprising 41.8% percent of the 2005 WIP) and used them to update the CIWMB data. In most cases, however, these updates were modest.

Yearly amounts of deposited waste are necessary inputs for the IPCC FOD model to work properly. Yearly data were not available before 1990, however, only the cumulative WIP totals in 1990 were known. This led staff to estimate how much of these cumulative amounts were deposited each year from the landfills' opening year to 1990 (or up to their closure year if they closed, before 1990). This estimation was made as follows. First, ARB staff inquired about the opening and closure dates for all landfills. CIWMB staff had closure dates for ali 372 landfills of interest, but did not have a complete list of opening dates, so an estimate was made for those cases where the opening date was missing. Once these dates were established, the cumulative total ofWIP in each landfill was distributed over the pre-1990 years (from opening to 1990, or opening to closure if before 1990) in a manner commensurate to the trend in California's population

over those years. As a result, a larger proportion of the waste in place was distributed in the later years of this range than in the earlier ones, since the population kept growing over the time period.

(a.ii) Components of the Waste-in-Place

To determine its DOC and DANF, the WIP must first be disaggregated into its component parts. Disaggregation was done on the basis of waste characterization studies from the CIWMB and the USEPA. The CIWMB studies were conducted in 1999 and 2004; the1999 study was used to characterize waste for 1995 to 2002 and the 2004 study for 2003 and beyond, as suggested by the CIWMB staff. For years prior to 1995, staff used the USEPA study that best applied to a given year. The USEPA did waste characterization studies in 1960, 1970, 1980 and 1990. Staff used the waste profiles from those studies as follows: up to 1964 (1960 survey), 1965-1974 (1970 survey), 1975-1984 (1980 survey) and 1985-1994 (1990 survey). Applying these profiles allowed disaggregating the waste deposited each year into its component parts. The components of interest to estimate TDOC (Le., those containing 'biodegradable carbon content) are listed in Table 1.

Table 1: *Waste characterization - Percentage* of *each component in the overall waste in place*

Waste Component	*Up* to **1964**	**1965-1974**	**1975 -1984**	**1985-1994**	**1995-*2002***	***2003+***
Newspaper	6.4%	6.4%	5.9%	4.8%	4.3%	2.2%
Office Paper	7.4%	8.2%	11.6%	12.5%	4.4%	*2.0%*
Corrugated Boxes	13.8%	16.2%	11.4%	*10.6%*	4.6%	5.7%
Coated Paper	2.5%	2.4%	2.9%	2.5%	16.9%	11.1%
Food	14.8%	11.3%	9.5%	12.1%	15.7%	14.6%
Grass	12.1%	*10.3%*	*10.1%*	*9.0%*	5.3%	2.8%
Leaves	6.1%	5.1%	*5.0%*	4.5%	2.6%	1.4%
Branches	6.1%	5.1%	*5.0%*	4.5%	2.4%	2.6%
Lumber	3.7%	3.3%	5.1%	*7.0%*	4.9%	9.6%
Textiles	2.1%	1.8%	1.7%	*4.0%*	2.1%	4.4%
Diapers	*0.1%*	*0.3%*	1.4%	1.6%	6.9%	4.4%
Construction/Demolition	2.6%	2.5%	3.5%	3.9%	6.7%	12.1%
Medical Waste					*0.0%*	*0.0%*
Sludge/Manure					*0.1%*	*0.1%*

* Dash indicates no data available; percentage assumed to be *zero.*

The combined amounts of green waste and sludge used as daily cover were included with landfills WIP. According to CIWMBstaff, most of the daily cover is green waste, thus ARB staff assumed that 10% of the daily cover amounts were percent sludge and 90 percent green waste. Green waste was further categorized as 50% grass cuttings, 25% leaves and 25% branches, based on USEPA studies (Table 2) Greenwaste was further split based on USEPA study assumptions that 50 percent is Grass, 25 percent Leaves and 25 percent Branches.

Table 2: Waste characterization of daily cover material

Daily Cover Waste Component	***Assumed Content Percentage***
Sludge/Manure	*10%*
Grass	45%
Leaves	22.5%
Branches	22.5%

(a.iii) Degradable Organic Carbon (DOC) content

Staff obtained values for the Degradable Organic Carbon (DOC) content of solid waste components from USEPA (Newspaper, Office Paper, Corrugated Boxes, Coated Paper, Food, Grass, Leaves, Branches) and from the 2006 IPCC Guidelines (Lumber, Textiles, Diapers, Construction/Demolition, Medical Waste, Sludge/Manure). These values are summarized in Table 3.

Table 3: *Degradable Organic Carbon (DOC) content* of *different MSW components*

(a.iv) Decomposable Anaerobic Fraction (DANF)

Theoretically, all biodegradable carbon-bearing waste can degrade, but only a portion actually degrades in the special anaerobic environment of landfills. The carbon in the waste that does not decompose remains sequestered.

Values for the DANF of different MSW components came from USEPA (Newspaper,Office Paper, Corrugated Boxes, Coated Paper, Food, Grass, Leaves, and Branches), the CEC (lumber) and the IPce guidelines (default of 50

percent anaerobic decomposition for Textiles, Diapers, Construction/Demolition, Medical Waste, and Sludge/Manure).

Table 4: Decomposable anaerobic fraction (DANF) of the DOC of different MSW components

Waste Component	***Decomposable Anaerobic Fraction***	***Source***
Newspaper	*0.161*	*USEPA*
Office Paper	*0.874*	*USEPA*
Corrugated Boxes	*0.383*	*USEPA*
Coated Paper	*0.210*	*USEPA*
Food	*0.828*	*USEPA*
Grass	*0.322*	*USEPA*
Leaves	*0.100*	*USEPA*
Branches	*0.176*	*USEPA*
Lumber	*0.233*	*CEC*
Textiles	*0.500*	*IPCC*
Diapers	*0.500*	*IPCC*
Construction/Demolition	*0.500*	*IPCC*
Medical Waste	*0.500*	*IPCC*
Sludge/Manure	*0.500*	*IPCC·*

(a.v) Overall Waste Profile and Estimate of landfilled Carbon Sequestration

With the data described above, staff calculated the overall waste profile for California (Table 5). Staff also estimated the amount of non-decomposable organic carbon in landfills, that is, the carbon which is expected to remain sequestered until removed from the anaerobic conditions present in landfills (Table 6). Most of the waste in landfills is non-biodegradable. Of that portion that

is biodegradable (19% to 24%) most will not decompose in a landfill environment and instead will remain permanently sequestered.

Table 5: *Overall waste profile for California - Percentage of each component in the overall waste in place*

Waste Type	*Up* to **1964**	**1965-1974**	**1975-1984**	**1985-1994**	**1995-2002**	**2003+**
Biodegradable Carbon	23.36%	22.96%	*23.07%*	23.54%	21.78%	*19.00%*
• *Decomposable*	8.85%	*8.90%*	9.47%	*10.17%*	7.81%	6.72%
• *Sequestered*	14.51%	*14.06%*	*13.60%*	13.37%	13.97%	12.28%
Other Materials	76.64%	*77.04%*	76.93%	76.46%	78.22%	*81.00%*

Most of the waste in landfills is non-biodegradable. Of that portion that is biodegradable (19 percent to 24 percent) most will not decompose in a landfill environment and instead will remain permanently sequestered.

Table 6: Estimate of carbon sequestration in landfills (million metric tonnes of carbon)

Waste Component	***1990***	***2004***
Newspaper	*0.772*	*0.339*
Office Paper	*0.258*	*0.039*
Corrugated Boxes	*1.092*	*0.567*
Coated Paper	*0.330*	*1.400*
Food	*0.100*	*0.115*
Grass	*0.480*	*0.144*
Leaves	*0.793*	*0.238*
Branches	*0.424*	*0.235*
Lumber	*0.952*	1.256
Textiles	*0.198*	*0.210*
Diapers	*0.079*	*0.206*
Construction/Demolition	*0.032*	*0.095*
Medical Waste		*0.001*
Sludge/Manure		*0.001*
TOTAL	5.51	4.85

Note: comprehensive carbon sequestration estimates for all years 1990-2004 are available upon request.

(b) Change in ANOOC

Next, staff used the IPCC FOD model to calculate the change in ANDOC over time, determining how much of the anaerobically degradable organic carbon remains at the end of each year:

Equation 3: Change in anaerobically degradable organic carbon in landfills

$$ANDOCstock_{Year(i+1)} = ANDOCstock_{Year(i)} \cdot e^{-k} + ANDOCadded_{Year(i-1)} \cdot \frac{1}{k}\left(e^{-k\cdot\left[1-\frac{M}{12}\right]} - e^{-k}\right) - \frac{M}{12} \cdot e^{-k} + ANDOCaddedYear(i) \cdot \frac{1}{k}\left(1 - e^{-k\cdot\left[1-\frac{M}{12}\right]}\right) + \frac{M}{12}$$

Where,

ANOOCstock$_{Year(i+1)}$ = stock of ANOOC remaining un-decomposed at the end of inventory year i, and thus present in the landfill at the beginning of the next year (year i+1), (g)

ANOOCstockYear(i) = stock of ANOOC present in the landfill at the beginning of inventory year i, Le., remaining un-decomposed at the end of the previous year (i-1), (g)

ANOOCadded$_{Year(i-1)}$ = ANOOe added during the. previous inventory year (year i-1), (g)

ANOOCaddedYear(i) = ANooe added during inventory year i, (g)

M = Assumed delay before newly deposited waste begins to undergo anaerobic decomposition (months),default value = 6 months

k = Assumed rate constant for anaerobic decomposition; k = In2/half-life (years); the half-life being the number of years required for half of the original mass of carbon to degrade (Table 7).

This calculation is performed iteratively for all subsequent years, starting with the landfill opening year and ending with the inventory year of interest.

Table 7: Assumed rate constant values for anaerobic decomposition (k)

Average Rainfall (InchesIYear)	*kvalue*
<20	*0.02*
20-40	*0.038*
>40	*0.057*

Source: USEPA

(c) Methane Generation

Equation 4; Methane generation in landfills

$$G_{CH4} = F_{CH4} \cdot \left[ANDOCstock_{year(i)} \cdot (1 - e^{-k}) + ANDOCaddedYear_{(i-1)} \cdot \left[\frac{1}{k} \cdot \left(e^{-ko\left[1-\frac{M}{12}\right]} - e^{-k} \right) - \frac{M}{12} \cdot e^{-k} \right] + ANDOCaddedYear(i) \cdot \left[1 - \frac{M}{12} - \frac{1}{k} \cdot \left(1 - e^{-ko\left[1-\frac{M}{12}\right]} \right) \right] \right]$$

Where,

G_{CH4}	= CH_4 generated during inventory year i (g)
F_{CH4}	= Fraction of decomposing carbon that is converted into CH_4, default value = 0.5 .
ANDOCstockYear(i)	= Stock of ANDOC present in the landfill at the beginning of inventory year i (g)
ANDOCaddedYear(i-1)	= ANDOC added during the previous inventory year (year i-1)
ANDOCaddedYear(i)	= ANDOC added during inventory year i (g)
M	= Assumed delay before newly deposited waste begins to undergo anaerobic decomposition (months), default value = 6 months
k	= Assumed rate constant for anaerobic decomposition; k = ln2/half-life (years); the half-life being the number of years required for half of the original mass of carbon to degrade (Table 7).

(d) Emissions Estimates

Equation 5: CH_4 emissions from landfills

$$E_{CH4} = G_{CH4} \cdot CE_{LFG} \cdot (1 - DE_{LFG}) + G_{CH4} \cdot (1 - CE_{LFG}) \cdot (1 - OCH4)$$

Where,

E_{CH4}	= Emissions of CH_4 from landfill (g)
G_{CH4}	= Amount of CH_4 generated by the landfill during the inventory year (g)
CE_{LFG}	= Landfill Gas Collection Efficiency, the fraction of generated landfiJl gas captured by the collection system (default value = 0.75)
DE_{LFG}	= Landfill Gas Destruction Efficiency, the fraction of CH_4 in the captured landfill gas oxidized to CO_2 (default values = 0.99 for combustion/thermal oxidation, and 0.01 for carbon filtration)
OCH4	= Fraction of uncollected CH_4 that is oxidized to CO_2 in the landfill cover (default value = 0.1)

CIWMB staff provided information about which landfills have gas·collection systems and what control method they use, if any. Responses to an ARB survey allowed staff to update a portion of the CIWMB numbers: For years where CIWMB data was lacking on the year of collection system installation (primarily years 1991 - 2003), staff used existing regulatory requirements to help estimate the installation dates. Staff intends to improve the accuracy of collection system installation dates in the future.

Staff assumed that a landfill gained the full benefits of gas collection beginning with the year in which the system was first installed. In the future, as the exact month of installation and start-up operation becomes available, it will be factored in and the collection efficiency for that year may be prorated.

CIWMB staff also provided the type of control landfills are using, including: simple venting to the atmosphere, carbon adsorption, or combustion (flaring, engines, thermal oxidizers, etc.). In the case of combustion, ARB staff assumed that 99 percent of the CH4 was converted into CO_2 and 1 percent escaped as CH_4. For carbon adsorption, 1 percent of the CH_4 was assumed captured and 99 percent released. For venting 100 percent of the CH_4 was assumed released.

Each site with a gas collection system was assigned a default of 75% percent collection efficiency and a defaultof 10 percent oxidation for the uncollected landfill gas as it migrates through the landfill cover into the air. Using these default valuesThe defaults of 75 percent for collection efficiency and 10 percent for oxidation fraction has been the object of some debate. Staff recognizes that many values can be found for these factors in the literature and that some site-specific measurements and local estimates do exist. However, given the current lack of rigorous, scientifically-based measurement data, staff chose to use the default values established by USEPA. As better data become available through current and future research, staff will update the collection efficiency and oxidation factors for estimating landfill gas emissions.

(d.i) Use of *Site Specific SUNey Data*

Using the First Order Decay model from the IPCC guidelines, staff estimated the amount of carbon sequestered and the amount of CH_4 emitted by each of the 372 landfills of interest in California.

ARB staff also surveyed landfill operators and some landfills provided site-specific landfill gas collection data for certain years of operations (30 of the 372 landfills submitted site specific survey. data). These data were used either to replace or to improve the model's estimates for that landfill.

When staff received landfill survey data for a particular year, it used the survey information in place of the model estimate. However, survey data included only the amount of gas collected, and not the amount generated since landfill

operators only know what is measured at the point of collection. To estimate the amount of gas generated, a default collection efficiency of 75 percent was used and the amount of collected-gas was divided by 0.75 to obtain an estimate of the generated gas. Then, the estimate of gas generated-based on the amount of gas collected-was used to replace the model estimate for that year.

When an actual value for the CH_4 fraction in landfill gas was reported in the survey, staff used it instead of the general default landfill gas composition assumption of 50 percent CH4 and 50 percent CO_2. However, because CO_2 specific fractions were not obtained from the site specific survey data (only CH_4 fractions were obtained), it was assumed that whatever was not reported as CH_4 was CO_2. Staff recognizes that N_2 gas and small amounts of 02 are expected to be present, and therefore not "all of the remaining gas (Le., the fraction that is not CH_4) is CO_2. Nevertheless, the amounts of these other gases were considered to be negligible'for the purpose of estimating the C02 emissions from landfills. As data improves, this conservative assumption may be revisited.

When landfill survey data was provided for some of the years and not others, staff used the provided years to improve the model estimates for the missing years by interpolating or extrapolating using the model predicted trend for that landfill. For example, if the years 1990-1993 were missing from a set of survey data for a particular landfill, but the year 1994 was available, then the years 1990-1993 were extrapolated from this 1994 data point by following the trend the model showed for that landfill. So if the model indicated that the CH_4 generation in 1993 was 3 percent lower than the 1994 predicted value, the available 1994 value from the survey was multiplied by 97 percent to estimate the 1993 point, and so on. This method of filling missing data preserves a consistent trend that smoothly joins the survey data. The same methodology was used to estimate CO_2 emissions when missing survey data were encountered.

An exception was made to these procedures in the case of survey-reported first years of operation of a collection system. These reported values were not used as a substitute for model estimates, as it was not known if the indicated first year represented a full year of operation. Staff assumed that the second year of reported data was a complete year and used that year as the starting point, ignoring data from the first year. For surveys with collection system data dating back to 1990, staff assumed that the 1990 value represented a full year of, operations and always made use of it. Staff made this assumption since data was not available to indicate if 1990 was the first year of operation and no survey data was available for 1989.

(d.ii) Emissions from Landfill Gas Combustion

Emissions of N20 from the combustion of landfill gas are included in the inventory. These emissions are a function of the BTU content of the landfill gas being burned. The amount of landfill gas burned (LFG) is determined from model

output for the amount of gas collected and from CIWMB data indicating which landfills burn their captured gas.

Equation 6: N_20 emissions from landfill gas combustion

$$E_{N20} = LFG \cdot F_{CH4} \cdot HC_{CH4} \cdot EF_{cH4}$$

Where,

EN20	= N_20 emissions from landfill gas combustion (grams)
LFG	= Landfill gas captured and burned (standard cubic feet)
FCH4	= CH_4 fraction of landfill gas (unitless)
HCCH4	= Heat content of CH_4 (BTU / standard cubic foot)
EF_{cH4}	= N20 emission factor of CH_4 (grams per BTU)

3. Data Sources

The First order decay model is from the 2006 IPCC guidelines (IPCC, 2006b). Waste characterization data was obtained from studies made by the California Integrated Waste Management Board (CIWMB, 2007d) and by the USEPA (USEPA,2007b). Degradable Organic Carbon (DOC) content and values for Decomposable Anaerobic Fraction (DANF) were taken from USEPA (USEPA, 2002). DANF data for lumber comes from the California Energy Commission (CEC, 2006), Default values used for DANF and DOC content of waste in place, and CH_4 combustion emission factors were taken from the 2006 IPCC Guidelines (IPCC, 2006b). Default collection capture effi.ciency and CH_4 oxidation factor values were obtained from the USEPA through personal correspondence (Weitz, 2007). Landfill gas collection, geographic coordinates and control data for California landfills were provided by CIWMB staff through personal communication (Walker, 2007). Average precipitation data for the landfills was extracted from a map published by the NRCS (NRCS, 2007). Methane and nitrous oxide emissions factors are from IPCC Guidelines (IPCC, 2006a).

. For a list of yearly activity and parameter values used in the equations, please consult the online documentation annex at:
http://www.arb.ca.gov/cc/inventorv/doc/methods v1/annex 4a landfills.pdf

4. Future Improvements

More complete, California-specific landfill survey data on landfill gas collection and composition will help improve outputs from the IPCC model. Improved survey data should also establish actual opening dates for landfills and perhaps provide better data on the percent C02 content of landfill gas. Better information on the cover types present at landfills and further details on gas collection systems will allow for better collection and oxidation factor estimates. Ongoing research and other studies will be followed closely by staff to improve estimates of landfill gas emissions.

References for Appendix C

CEC, 2006. Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004. CEe Publication CEC-600-2006-013-SF.' Available online: http://www.energy.ca.gov/2006publications/CEC-600-2006-013/CEC-600-2006-013-SF.PDF

CIWMB,2007d. Solid Waste Characterization Database, California Integrated Waste Management Board, Sacramento. Accessed online, fall 2007, at: http://www.ciwmb.ca.govlWasteChar/

IPCC, 2006a. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T., and Tanabe K. (eds). Volume 2, Chapter 2: Stationary Combustion. <http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2 Volume2N2 2 Ch2 Stationary Combustion .pdf>

IPCC,2006b. 2006 IPCC Guidelinesfor National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston HAS., Biennia L., Miwa K, Negara 1. and Tanabe K. (eds). Volume 5: Waste. Published: IGES, Kanagawa, Japan. http://www.ipcc-nggip.iges.or.jp/public/2006gl/voI5.html

NRCS,2007. Map of Average precipitation data for California, US Department of Agriculture National Resources Conservation Service's Geospatial Data Gateway. Accessed online, fall 2007, at: http://datagateway.nrcs.usda.gov/

u.S. EPA, 2002. Solid Waste Management and Greenhouse Gases - A Life Cycle Assessment of Emissions and Sinks. 2nd Edition, May 2002. Exhibit 7.3 page 107. US Environmental Protection Agency, EPA publication 530-R-02-006.

u.S. EPA, 2007b. Municipal Solid Waste Characterization Reports (various years), US Environmental Protection Agency. Accessed online, Fall 2007, at: http://www.epa.gov/epawaste/inforesources/pubs/municipalsw.htm

Walker,2007. Personal communication (Collection, LatlLon, and Control Data for Landfills) between Larry Hunsaker of CA Air Resources Board and Scott Walker, California Integrated Waste Management Board. Fall 2007.

Weitz, 2007. Personal communication between Larry Hunsaker of CA Air Resources Board and Melissa Weitz, US Environmental Protection Agency. Fall 2007.

Appendix D

Evaluation of Landfill Gas Collection Efficiency

Appendix D

Evaluation of landfill Gas Collection Efficiency

A. Introduction

This appendix provides a brief overview of the methodology used to estimate the expected collection efficiency that can be reasonably achieved by a well-controlled landfill subject to the proposed regulation to reduce methane emissions from municipal solid waste landfills. As discussed in this staff report, the proposed regulation will provide enhanced control of methane emissions from municipal solid waste landfills by requiring the installation of gas collection and control systems at smaller and other uncontrolled landfills. The control measure also includes requirements for all affected landfills to ensure that gas collection and control systems are operating optimally and that fugitive emissions are minimized.

In order to better understand the proposed regulation's impact on collection efficiency, ARB staff evaluated the collection efficiency values for a well-controlled landfill in Palos Verdes, California by performing air dispersion modeling coupled with actual landfill surface gas measurements conducted by District staff. This landfill is owned and operated by the Los Angeles County Sanitation District (District). The District had previously evaluated the gas collection efficiency at this same landfill using actual surface gas measurements and U.S. EPA's air dispersion model-Industrial Source Complex (ISCST3). However, since U.S. EPA phased out the use of the ISCST3 model in 2006, ARB staff conducted the air dispersion modeling using U.S. EPA's new approved replacement model- AERMOD. Below a brief overview of the approach used to determine the landfill collection efficiency using AERMOD modeling and the previously collected landfill gas measurements at the Palos Verdes landfill.

B. Methodology

1. Data Processing

The following data were obtained from the District:

- Methane (CH_4) concentration measurements from the Palos Verdes landfill surface in irregular time periods, in parts per million (ppm)
- Landfill gas emission rate (as estimated from the collection system)
- Various modeling parameters (area dimension, emission rates, etc.)

ARB staff evaluated the data sets to ensure there were no outliers. Because the me.asurements were not taken continuously over a one-hour period, staff used the

average of any measurements that occurred within the same hour, date, and month and to represent the entire hour for that specific day.

2. AERMET Modeling

The AERMOD model requires meteorological parameters to characterize air dispersion dynamics in the atmosphere. These parameters are estimated by AERMOD's supporting meteorological processing model, AERMET. The meteorological data used in the model were selected on the basis of representativeness and availability. Representativeness is determined primarily on whether the wind speed/direction distributions and atmospheric stability estimates generated through the use of a particular meteorological station (or set of stations) are expected to mimic those actually occurring at a location where such data are not available. Typically, the key factors for determining representativeness are proximity of the meteorological station and the presence or absence of nearby terrain features that might alter airflow patterns. For this study, 2003 meteorological data from the Los Angeles International Airport (LAX) was used. LAX is about one mile away from the Palos Verdes landfill. For the upper air conditions, San Diego-Miramar and Oakland International Airport are two full-time and reliable stations in California. As the Miramar station is much closer to the landfill, it was used in this study. After running AERMET, the hourly meteorological data for the full year of 2003 were created. The processed meteorological data, including surface and upper air, were filtered to retain only hours corresponding to times of the measurements. The filtered meteorological files were rearranged into a time period with consecutive hours.

3. AERMOD Modeling

The recently U.S. EPA approved air dispersion model- AERMOD, ratherthan ISCST3 (phased out on November 9, 2006), was used to estimate the CH_4 hourly 'concentrations' within the landfill in the same time series order as the measurements. Key model parameters are as follows: .

Model:	AERMOD
Run Mode:	hourly concentrations (in $\mu g/m^3$)
Model Option:'	area source (polygons)
Dispersion Coefficients:	Urban and Rural
Modeling Domain:	800 m x 800 m
Modeling Resolution:	50 m x 50 m for 256 receptors
Receptor Setting:	Placing on center of each area source (1.5 in)
Meteorological Data:	Surface station - LAX (2003),
	Upper air - San Diego-Miramar (2003)

4. Calculations of CH_4 Gas Collection Efficiency Based on AERMOD

The modeled CH_4 concentration by AERMOO can be regarded as an equivalent concentration reduction in the landfill surface achieved by gas collection (CH_r) where the model estimates the emissions that are captured through the laAdfill extraction wells. Gas generation is expressed as the sum of the modeled reduction at the surface due to collection and the measured surface CH_4 (CH_m) due to emissions. Gas collection efficiency is then calculated by Equation 1:

$$E = \frac{CH_r}{CH_r + CH_m} \quad . (1)$$

5. Conversion of Mass Concentration to Volume Concentration

The outputs from AERMOO are reported as mass concentrations for CH_4 (in $\mu g/m^3$), while the measured CH_4 were reported as volume concentrations (in ppm). The conversion of mass concentration into volume concentration can be made by Equation 2 at a standard air pressure of one atm condition for CH_4:

$$C_{mass} = 1.95 * 10^5 \frac{x C_{ppm}}{T} \quad (2)$$

where C_{mass} is the CH_4 mass concentration (in IJg/m^3), C_{ppm} is the CH_4 volume concentration (in ppm), and T is the atmospheric air temperature (in Kevin). Note that all terms are also a function of time.

C. Results

1. Gas Collection Efficiency Derived from AERMOD Modeling

Table 1 presents the gas collection efficiency determined following Equation 1 and using the AERMOO modeled outputs and CH_4 measurements as inputs to the equation. Any hour with modeled zero concentration was not included in the analysis and the corresponding measurement during that hour was also not included. In addition, because there were hours in which there resulted negative CH_4 concentrations after subtracting the background concentration and being corrected for instrument bias, two sets of collection efficiency values are reported in Table 1 - the "collection efficiency" and the "corrected collection efficiency." "Collection efficiency" represents the results without removing any hours that had negative concentrations of CH_4 and "corrected collection efficiency" represents the results after removing any hours that had negative CH_4 concentrations. As shown in Table 1, the results demonstrate a collection efficiency of about 85 percent for the gas collection system in the Palos Verdes landfill.

Table 1. Gas Collection Efficiency Derived from AERMOD Modeling

	CH4Conc	
	Urban	Rural
Measured LF Surface	2.498	2.498
Bias Correction	0.059	0.059
Actual LF Surface	2.557	2.557
Air Background	1.835	1.835
LF Cone (CHm)	0.722	0.722
Corrected LF Cone (CHm)*	0.879	0.879
Modeled Cone (CHr)**	4.873	4.748
Total Conc (CHr+CHm)	5.595	5.470
Corrected Total Conc (CHr+CHm)	5.752	5.627
Collection Efficiency	87.10%	86.80%
Corrected Collection Efficien	84.72%	84.38%

Note:
1. The hours with measurements being less than the background were excluded for'the analysis;
2. The hours with modeled zero concentrations were excluded for the analysis.

2. Distribution of Methane Concentrations over the Landfill

Figure 1 shows the spatial distribution of the modeled CH_4 concentrations over the landfill. The concentrations are averaged over the monitoring time period or all monitoring hours. The distribution is nearly uniform except *near* the landfill boundaries. This implies that the results are not sensitive to the locations of receptors within the landfill, and that the gas collection efficiency approach presented above based on the overall average measurements and average modeled concentrations is reasonable. In fact, a grid-by-grid analysis versus the overall average analysis showed a difference of about 1 percent (analysis' not shown).

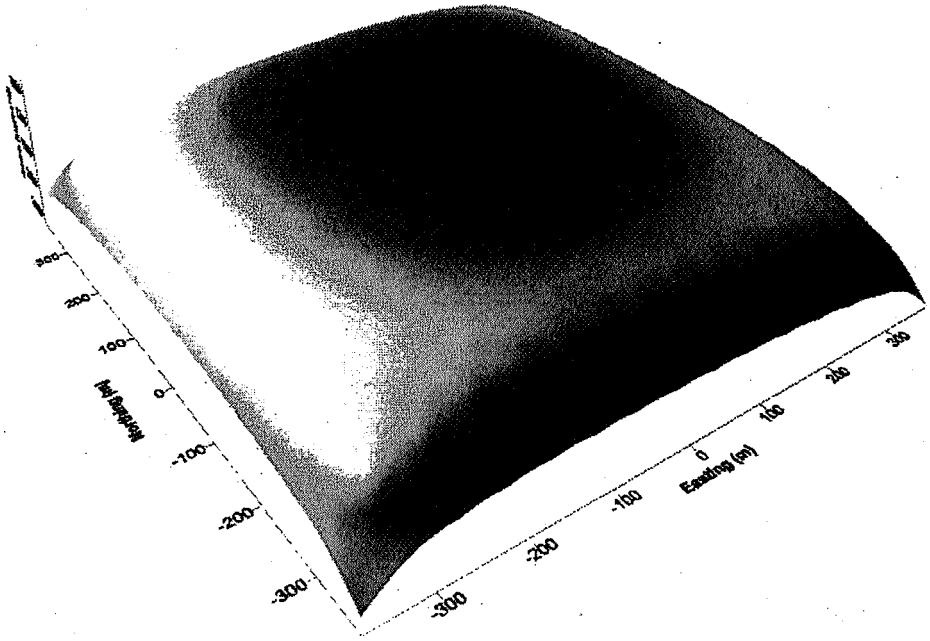


Figure 1. Spatial Distribution of the
Modeled CH_4 Concentration over the Landfill Surface

3. Distribution of Methane Concentrations Beyond the Landfill

To investigate how the CH_4 concentrations change with downwind distance outside of the landfill, a modeling run was conducted by placing the receptors along the central line of the domain in the predominate wind direction at distances of 0, 1, 5, 10, and 20 m from the landfill boundary. The modeled CH_4 concentrations are normalized to those that are located on the boundary 'and on the center of the modeling domain, respectively. The results are summarized in Figure 2. As shown in Figure 2, the CH_4 concentrations decrease with the downwind distance rapidly. At 10 meters, the CH_4 concentrations have decreased by about 40 percent and at 20 meters by about 60 percent compared with those at the boundary.

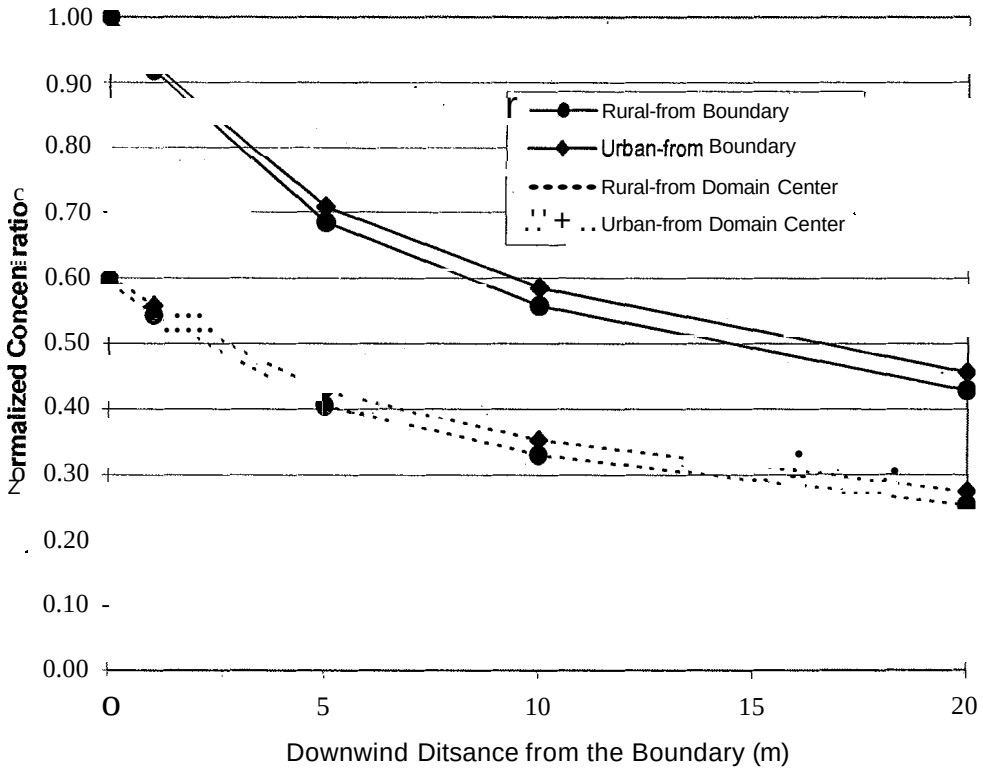


Figure 2. Normalized CH_4 Concentrations vs. Downwind Distances

4. Distribution of Methane Concentrations over Receptor Heights

To see how the modeled CH_4 concentrations change with receptor heights, we conducted a sensitivity study using AERMOD by placing receptors on the center of the modeling domain with different heights - 0, 0.5, 1, 2.5, 5, and 10 meters above the landfill surface: The results are normalized and presented in Figure 3. It is apparent that the setting of receptor heights plays an important role in determining the gas collection efficiency. For this study, the height of all receptors was placed in a height of 1.5 inches which was identical to the measurement height.

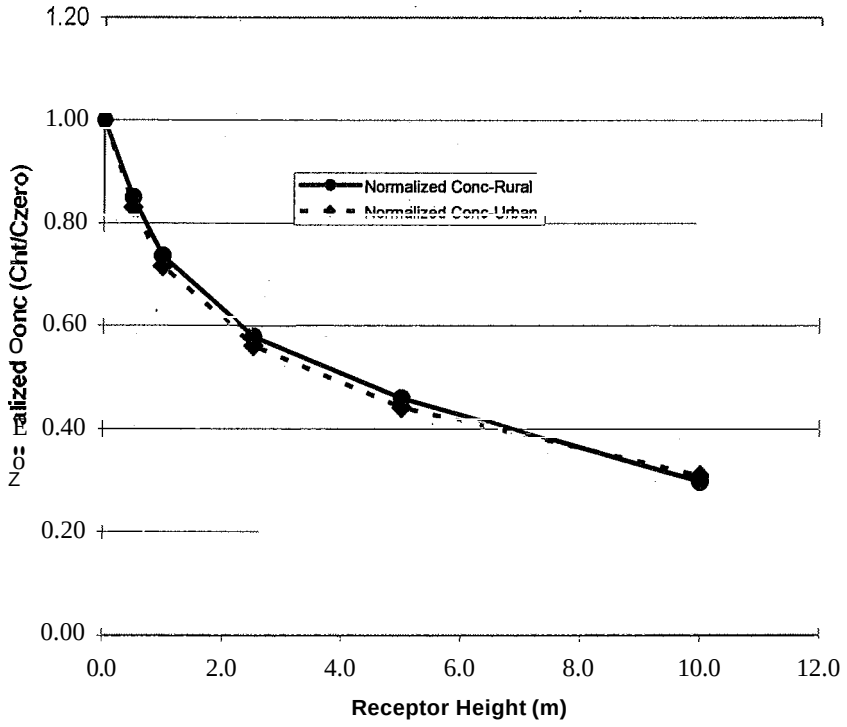


Figure 3. Normalized CH_4 Concentrations vs. Receptor Heights

Appendix E

AS 32 Requirements and Criteria

Appendix E

AB 32 Requirements and Criteria

This appendix provides a discussion of why staff believes the proposed regulation meets the limited criteria applicable to discrete early action measures, as well as furthers the later requirements of State law applicable to GHG measures generally.

- **The State Board shall adopt rules and regulations in an open public debate process to achieve the maximum technologically feasible and cost effective greenhouse gas emission reduction from sources or categories of sources.**

  Staff developed the proposed regulation to reduce methane emissions from MSW landfills in consultation with stakeholders inan open, public process through three public workshops and seven landfill workgroup meetings. See Chapter V of this report for additional details.

  The proposed regulation is technologically feasible and is similar to existing federal and district landfill gas rules for NMOCs and VOCs. It was developed based on information obtained from ARB's landfill inventory, and from discussions with representatives from industry, federal, State, and local agencies, and environmental organizations. Many MSW landfills that are already using gas collection and control systems to minimize NMOC emissions are familiar with the requirements in the proposed regulation, except in the areas of enhanced surface emissions monitoring, component leak testing, and methane destruction efficiency requirements for the control devices. Control devices that are subject to and complying with existing federal requirements for MSW landfills would meet the destruction'efficiency requirements for methane in the proposed regulation. A detailed discussion of requirements of the proposed regulation is included in Chapter V.

  The proposed regulation is cost-effective, with an estimated cost-effectiveness of about $9 per metric ton of $C0_2E$ reduced. The cost estimates used to calculate the cost-effectiveness are based on discussions with industry, local air districts, CIWMB staff, and landfill gas control equipment manufacturers. A detailed discussion of the economic impacts is included in Chapter VII.

- **Design the regulations, including the distribution of emissions allowances where appropriate, in a manner that is equitable, seeks to minimize costs and maximize the total benefits to California, and encourages early action to reduce greenhouse gas emissions.**

  , The proposed regulation was designed to achieve the maximum GHG reduction benefit while minimizing the cost to the affected industry. Data on 367 landfills known to contain waste that is biodegradable was provided by CIMWB and used to develop ARB's landfill inventory. The landfill inventory was used to develop

requirements for MSW landfills that cons.idered the landfill's size, age, methane generation rate, and ability to support the continuous operation of a gas control device without the use of supplemental fuel, and the ability to reduce emissions in a cost-effective manner. .

In order to exclude landfills that are not likely to generate landfill gas in sufficient quantities to be collected and controlled (e.g., older, closed landfills or low emission' landfills located in arid areas of the state), the proposed regulation establishes thresholds for landfill size, landfill gas heat input capacity (or methane generation flow rate). In addition, the proposed regulation applies only to MSW landfills that received (or will receive) solid waste after January 1, 1977. Hazardous waste landfills and landfills containing only inert waste, like ash and masonry from demolition sites, are exempt.

To further reduce costs to MSW landfill owners and operators, the proposed regulation contains an incentive to increase the walking space pattern (from 25 feet to 100 feet) if there are no exceedances of the surface emissions standards after four consecutive monitoring periods. In addition, closed or inactive MSW landfills would be allowed to decrease their surface monitoring from quarterly to annually.

- Ensure that activities undertaken to comply with the regulations do not disproportionately impact low-income communities.

The decrease in methane emissions will occur statewide where MSW landfills are located, which is typically far from residential areas. Any residents living near a MSW landfill will receive the benefit of lower GHG emissions; lower exposure to toxic contaminants and odorous compounds contained in landfill gas, as well as a potential decrease in possible explosions caused by offsite gas migration.

- Ensure that entities that have voluntarily reduced their greenhouse gas emissions prior to the implementation of this section receive appropriate credit for early voluntary reductions.

The proposed regulation provides labor-saving incentives for landfills that can demonstrate compliance with the surface emission standards for four consecutive quarters (see Chapter V). However, there are a few landfills which may be able to demonstrate that they have been compliant with the surface emission standards for the previous three years. The proposed regulation allows these landfills to take advantage of the labor-saving incentives when the regulation becomes effective if the appropriate documentation can be provided.·

- Ensure that activities undertaken pursuant to the regulations complement, and do not interfere with, efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminant emissions.

The proposed GHG emissions limits are not expected to cause an increase in the emissions of criteria pollutants or toxic air contaminants (TAC) with the possible exception of a slight increase in oxides of nitrogen (NO_X) emitted from certain types of gas control devices such as internal combustion engines (IC engines). The proposed regulation will not interfere with local air district requirements for controlling VOC and TAC emissions from MSW landfill operations because GHG emission limits are not required by local air district rules and the control technologies are complementary.

- Consider cost-effectiveness of these regulations.

  The cost-effectiveness of the proposed regulation is about $9 per metric ton of CO_2E reduced, which is equivalent to an increase of about 10 cents per month to the waste disposal cost per California household. See Chapter VII and Appendix F for further discussion.

- Consider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health.

  The proposed requirements for MSW landfills are not expected to cause any significant adverse impacts to society or the environment. California will benefit from the reduction of methane emissions. The proposed regulation will not cause a significant increase in VOC or TAC emissions, however, a slight increase in NO_X emissions may occur in the unlikely event a landfill owner or operator selects an IC engine for gas control and energy recovery purposes. ARB staff has concluded that no adverse environmental impacts should occur from adoption of and compliance with the proposed regulation.

  Reducing methane emissions from MSW landfills will also remove NMOCs that would have otherwise been emitted. The potential benefits of the proposed regulation on reducing explosive gas migration, odors, and water quality impacts have not been quantified. See Chapter VI for further discussion.

- Minimize the administrative burden of implementing and complying with these regulations.

  The administrative burden to landfill owners or operators complying with the proposed regulation is reduced by minimizing duplication of reporting efforts. For reporting purposes, owners or operators may submit equivalent documents (e.g., district permits or compliance plans) in place of the documents required in the proposed regulation provided that they contain the necessary information required by the proposed regulation and the information is clearly identified in the equivalent documents. ARB staff expects that most local air districts will request delegation from ARB to implement and assist with the enforcement of the proposed regulation and incorporate that effort in conjunction with their existing landfill programs.

Additionally, ARB is developing a landfill gas tool to assist owners and operators in estimating their landfill's fugitive methane emissions, potential landfill gas generation rate, *and* landfill gas heat input capacity.

- Minimize leakage.

  Leakage occurs when an emission limit set by the State causes manufacturing or other activities and their associated GHG emissions to be displaced outside of California. If leakage were to occur, jobs and other economic benefits to California would be lost. No leakage is expected from the proposed regulation. ARB staff believes that the regulation would not create a situation where MSW landfills located in California would be placed in a competitive disadvantage compared to MSW landfills located out-of-state. In most cases, it is infeasible to transport wastes very long distances.

- Consider the significance of the contribution of each source or category of sources to statewide emissions of GHGs.

  In California, MSW landfills are the second largest anthropogenic source of methane (ARB, 2009). ARB staff estimates that fugitive emissions of methane from MSW landfills represent about 1 percent of the statewide gas GHG inventory. The total projected reductions that will be achieved from landfills subject to the proposed regulation are about 1.2 MMTC0_2E in 2010, 1.4 MMTC0_2E in 2015, and 1.5 MMTC0_2E in 2020. While this reduction is somewhat modest, it is necessary in order to achieve the long-term GHG emission reduction goals. When the reduction is considered in conjunction with current and future GHG emission reductions in other sectors, the total reductions are significant.

- The GHGgas emissions reductions achieved are real, permanent, quantifiable, verifiable and enforceable by the state board.

  ARB staff believes that the emissions and emission reductions for MSW landfills operations are real. The emissions and emission reductions were determined using the Mathematically Exact First-Order Decay model from the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines (IPCC, 2006) and through landfill surveys requesting site-specific landfill gas collection data from landfill owners and operators. The GHG reductions are verifiable through annual reporting and recordkeeping requirements included in the proposed regulation. These requirements also support enforcement efforts. Sources installing gas control devices to comply with the proposed regulation are also subject to local air district permitting requirements. Once the proposed regulation is approved by the Office of Administrative Law, the proposed regulation will become State law and enforceable by the Board.

- For regulations, the **reduction** is in addition to any GHG emission reduction otherwise required by law and regulation, and any other greenhouse gas emission reduction that otherwise would occur.

  The proposed regulation for reducing methane emissions from MSW landfills is the first GHG regulation affecting this industry. No other local, State, federal, or other requirements, specific to reducing methane emissions from MSW landfills in California, are known to exist. While there are federal and local requirements applicable to MSW landfills, the proposed state regulation demonstrates GHG emission reductions beyond what can be expected from existing requirements.

- If applicable, the GHG emission reduction occurs over the same time period and is equivalent in amount to any direct emission reduction required pursuant to this division.

  This requirement is not applicable to the proposed regulation for MSW landfills because it achieves its emission reductions as direct reductions.

- The state board shall rely upon the best available economic and scientific information and its assessment of existing and projected technological capabilities when adopting the regulations required by the law.

  ARB staff used the best available economic and scientific information to develop the proposed regulation for reducing methane emissions from MSW landfills. Chapter VII includes a detailed description of the economic impacts of the proposed regufation. Chapter III discuses the management of MSW, the methane generation process, methods for optimizing collection efficiencies, and control technologies for reducing methane emissions from MSW landfills.

Appendix F

Economic Impact Analysis Methodology

Appendix F

Economic Impact Analysis Methodology

A. Limitations and Scope of This Analysis

Landfills vary in s.ize, geometry, deposited waste composition, type of cover, topography, surrounding area geological characteristics, and local climate. These factors and others act in dynamic combination to affect both the rate of landfill gas production and its duration.

Due to the complex interaction of the above-mentioned factors, comprehensive site assessments are performed as a preliminary step in developing a design plan for installation of a landfill gas collection and control system. A site assessment includes on-site measurement and analyses of the above-mentioned factors that influence collection and control system design. ARB staff acknowledges that these steps are critical in designing and implementing a collection and control system. When examining landfills as an entire statewide emission source category, ARB does not have the resources to perform individual site assessments and prepare comprehensive design plans for all of the affected landfills in order to develop cost estimates.

ARB cost estimates are based on average or typical costs for the operations or actions necessary to comply with the proposed regulation, with the caveats and limitations inherent in using average or typical cost information; it is acknowledged that the actual costs to an affected landfill may be lower or higher than estimated, but the total cost to all affected landfills is expected to, be consistent with stated estimates.

The individual landfill compliance threshold trigger dates stated in this analysis are generated for cost estimation purposes only and are not intended to indicate actual compliance dates. Actual compliance dates for individual landfills should be determined by the m'ethods specified in the proposed regulation.

It should be noted that this analysis assumes the scenario where the sole compliance control method used is enclosed flare technology. Many landfills, especially larger ones, successfully employ various alternative technologies to use the captured landfill gas to generate energy for use at the landfill or for other purposes. Due to the specialized nature and objeGtives of these'projects and their costs, no attempt was made to include these projects in the cost analysis nor predict the future rate at which landfills operators may choose this compliance option.. To the extent that these projects produce a profit, compliance costs may be reduced for those landfill operations that choose this type of compliance option.

The analysis approach method used for this proposed regulation is consistent with methodologies used for other air quality regulations, but differs from the traditional analysis approach typically used in engineering economic analyses. In traditional

engineering economic analyses, analysis methods are used to determine the point at which a selected parameter is maximized while the cost is minimized (highest cost/benefit ratio). This approach is not used in this an.alysis. For this and other air quality regulations, the setting of air quality standards or levels are primarily based upon technical feasibility determinations and maximizing public health protection, with compliance costs being a secondary concern.

This analysis is an estimate of the incremental cost of the proposed regulation to both businesses (private) and government agencies (local, State, federal, tribal, ·and military). Incremental costs are the costs (or savings) to an affected landfill resulting from compliance actions required by the proposed regulation. These costs do not include the normal cost of operation ("cost of doing business") encountered without the proposed regulations' requirements.

B. Methodology

Using individual landfill data obtained from the California Integrated Waste Management Board (CIWMB) (CIWMB, 2009), the 218 affected California landfills were separated into two categories, those that are estimated to be subject to reporting requirements only, and those.that would be subject to reporting requirements as well as monitoring and possibly control requirements. The data used to determine the appropriate cost category included: waste-in-place (WIP) in tons projected for the year 2020 (target year for emission reductions for this proposed regulation under the AB 32 guidelines), landfill opening and closing (projected if still open) dates, existing control type (if any), local air district location (used to determine appropriate monitoring costs), and design size (acres). Costs for these two categories were calculated separately.

Table F-1 (next page) shows the cost categories and the parameters that place landfills into those categories.

Table F-1. landfill Cost Categories
(with> 450,000 Tons WIP and >= 3.0 MM Btu/hr)

Cost Category	Applicability
Capital (initial)	- Uncontrolled Landfills
	- Landfills *wl* Open Flares[1]
Operation and Maintenance	- Uncontrolled Landfills
	- Landfills *wl* Open Flares
Monitoring	- Controlled Landfills
	- Uncontrolled Landfills
	- Landfills *wl* Open Flares
Reporting	- All Affected Landfills

1. Treated as a separate category because these landfills are reqUired to install enclosed flares (with associated costs) by 2018.

C. Costs to landfills Subject to Reporting Only Requirements

For the landfills forecast to be subject only to the reporting requirements of-the proposed regulation (72 landfills), the costs were determined based on forecast waste-in-place data and calculated annual gas heat capacity. This group of landfills was further divided into two subgroups, those expected to need to file waste-in-place reports only (32 landfills) and those expected to file both report types (40 landfills). Neither subgroup is projected to need to comply with the monitoring requirements nor install gas collection and control systems.

The cost calculations for both the waste-in-place and landfill gas heat input capacity reports are shown on Worksheet 3 (Cost Subtotals) under Items 1 and 2. The labor rates selected are the mean hourly rates from the United States Bureau of Labor Statistics, for the San Francisco-Oakland-Fremont, California area (highest cost area of California) (USDL, 2009a). Since these labor rates are the latest available (May 2007), they are adjusted to year 2008 dollars using Adjustment Factor 1 in Table F-2 on the next page. An adjustment for benefits, etc., is made using Adjustment Factor 2, an . assumed 50 percent markup of labor costs to estimate the cost to an employer of an employee (USDL, 2009b). The markup was based on observed labor markup rates of 37 percent to 46 percent for federal, State, and local government employment, as well as for the private sector. The Adjusted Rates are used for hourly labor costs in this analysis.

Table F-2. Adjusted Hourly Labor Rates

Occupation	Unadjusted Rate *($Jhr)*	Adjustment Factor 1	Adjustment Factor 2	Adjusted Rate *($Jhr)*
Civil Enaineer	39.22	1.05	1.5	61.77
Civil Engineering Technician[2]	30.10	1.05	1.5	41.41
Secretaries, Exc. Legal, Medical, and Exec.[1]	27.84	.1.05	1.5	43.85

1. These rates are used to calculate the reporting costs.
2. This rate is used to calculate monitoring costs.

For preparation and submittal of both types of reports, it is assumed that the services of both a Civil Engineer and a Secretary will be needed. The waste-in-place reports required by the proposed regulation are also required by CIWMB on a less frequent basis than ARB; it is expected that the same report (with suitable updating) can be submitted to satisfy the waste-in-place requirement.

The per-report cost is used along with the operational status (open or closed/inactive) data for the affected landfills to determine the total reporting cost per landfill and also by owner/operator status (private and government) categories.

D. Costs to Landfills Subject to Reporting, Monitoring, and Control Requirements

Affected landfills in this group are potentially subject to incur compliance costs in all four of the cost categories listed in Table F-1.

Each affected landfill is listed in Worksheet 2 (MSW-Accepting Landfills Forecast to be Subject to Control Requirements); under each listing are four rows, each corresponding to one of the cost categories. (Unit costs are itemized and calculated on Worksheet 3 (Cost Subtotals.)) These rows are used to calculate the cost for that category for the landfill, if it is expected to incur expenses in that category. These calculations are as follows:

First Row: Used to calculate lump-sum and uniform annual payments for capital expenditure for landfills that will: 1) Need to install collection/control systems (landfills with no existing controls or carbon adsorption control), or 2) Those that will need to install enclosed flares (those currently equipped with open flares) by 2018, per the proposed regulation's requirements. Landfills with existing combustion control systems are expected to meet the proposed regulation's control efficiency requirements without incurring any additional costs, so for these landfills this row is blank.

1) Collection and control system costs for landfills with no existing collection and control systems are calculated using the maximum waste footprint (expressed in acres) supplied by CIWMB and multiplied by a per-acre cost (USEPA, 2009). The per-acre

cost is adjusted to year 2008 dollars under Heading 5a (Installation of New Collection and Control System--Capital Cost Landfills) on Worksheet 3 (Cost Subtotals).

2) For landfills that will need to install enclosed flares, the predicted maximum heat input (in MMBtu/hr) is used to look up the appropriate enclosed flare cost information on Worksheet 3 under Heading 4, Upgrade of Existing Collection/Control System--Capital Cost. It should be noted that these costs are approximate,given the instability of material and labor costs, as well as site specific issues such as electrical service costs. It is assumed that none of the landfills with open flares will be able to continue operating them after the year 2018 (though under certain conditions it may be permissible to do so), and that all open flares will be replaced with enclosed flares in the year 2018. .

For both control scenarios listed under 1)and 2) above, a 15-year amortization period is assumed, and the costs are expressed as a series of uniform payments starting in the compliance year. These costs are for the design, siting, and initial equipment costs only; annual operation and maintenance costs are discussed in the next section.

Second Row: Used to calculate annual operation and maintenance (O&M) costs. For landfills that will need to install collection and control systems or upgrade to an enclosed flare, operation and maintenance costs are considered a compliance cost. This is due to the assumption that these costs were either previously not incurred by the landfill or were at a significantly lower level, in the case of open flares. O&M costs are calculated as the product of the maximum waste footprint of the landfill (expressed in acres) multiplied by a per-acre cost (U.S. EPA, 2009) adjusted to year 2008 dollars. Also included in the total O&M cost is an allowance ($25,000/yr) for an annual emissions source test, which is typically required by a local air district as a permit condition.

As with the capital costs discussed in the First Row above, landfills with existing combustion control systems are expected to meet the proposed regulation's control efficiency requirements without incurring any additional O&M costs, so for these landfills this row is labeled "Existing".

Third Row: This row is used to calculate monitoring costs. Costs for emission monitoring are calculated using the rates on Worksheet 3, under Item 3b, Surface Emissions/Control & Collection System Monitoring--Cost per Landfill-Acre. Emission monitoring work may be performed by landfill operations staff or outsourced. Due to the lack of data *on* the current extent of outsourced monitoring work as well asthe recognition that the extent may change over time (as landfills decide to outsource the work or bring it in-house, or vice-versa), this analysis assumes that all landfills will perform their own monitoring work, and that the work will be performed by a Civil Engineering Technician (see Table F-2 for hourly rate).

Note that two different per-landfill acre rates are used, one for landfills located in the SCAQMD, and a second for all others. Different rates are used due to the differences in expected compliance actions.

Landfills in the SCAQMD are currently performing 'surface and collection/control equipment emission monitoring that is substantially equivalent to the requirements of the proposed regulation. Compliance for these SCAQMD landfills also includes landfill surface integrity repair work (landfill cover repairs) to mitigate emissions and meet the emission limits under S.CAQMD Rule 1150.1. For these reasons, the additional or incremental cost for monitoring and surface integrity work to comply with the proposed regulation is expected to be significantly less than that for non-SCAQMD landfills.

The monitoring cost rate for non-SCAQMD landfills takes into account an increased amount of monitoring time per acre to meet a more stringent standard than either local air district (non-SCAdMD) or U.S. EPA standards. In addition to a higher monitoring cost rate, a $50/acre average allowance for increased landfill surface integrity work (landfill cover repairs) is included. This allowance is included to account for increased landfill surface repair work necessary to meet the emission standards of the proposed regulation. It is an assumption based on landfill cover repair cost allowances submitted in selected reviewed landfill closure plans; there are several variables influencing the actual cost, which-cannot be predicted with any degree of certainty. These variables include: availability of on-site heavy equipment such as loaders, graders, etc. (availability more common for open landfills); need to contract out surface repair work, Le., bring in equipment and personnel to do work;'availability offill material; and present and future condition of the-landfill cover.

Monitoring costs for all landfills include a one-time, upfront $48,000 allowance for purchasing monitoring and related calibration equipment, though it is recognized that many landfills already subject to emission monitoring requirements may already possess monitoring equipment or have contracts in place for monitoring work.

Fourth Row: Used to calculate the reporting costs in'curred by a landfill. The same methodology is used as for the landfills in the Reporting Only cost category, please see Section C above for an explanation of the calculation process.

The compliance costs in each of the four categories described above are summed by category at the bottom of Worksheet 2 for all affected landfills and also by ownership status (for businesses 'and government agencies).

E. Total Cost of Proposed Regulation to Businesses and Government Agencies

The total cost of the proposed regulation (except for enforcement and related costs to ARB)to directly-affected businesses and government agencies is summarized in Worksheet 9.

Costs to State agencies (other than those related to compliance by affected landfills) are outlined-and calculated in Sections 6a through 6e of Worksheet 3 (Cost Subtotals.) These non-landfill-related State agency costs are only expected to be incurred by ARB

in activities related to the enforcement, monitoring, compliance, and outreach efforts related to the proposed regulation.

References for Appendix F

CIWMB, 2009. California Integrated Waste Management Board. Solid Waste Information System file downloaded from: http://www.ciwmb.ca.gov/SWIS/Search.aspx#DOWNLOAD January 7,2009.

Ford, 2009. April 21 ,2009 e-mail correspondence from Leslie Ford, ARB to Jon Manji, ARB.

Judge, 2009. Personal Communication, Hardip Judge, ARB, to Jon Manji, ARB. April 7, 2009.

Locke,2009a. April 7, 2009 e-mail yorrespondence from Tim Locke, John link Company, to Jon Manji, ARB.

Locke, 2009b. April 8, 2009 e-mail correspondence from Tim Locke, John link Company, toJon Manji, ARB.

USDL, 2009a. United States Department of Labor, Bureau of Labor Statistics. Occupational Employment Statistics. May 2007 Metropolttan and Nonmetropolitan" Area Occupational Employment and Wage Estimates. Website Accessed, March 22, 2009. http://www.bls.gov/oes/2007/may/oes_41860.htm

USDL, 2009b. United States Department of Labor, Bureau of Labor Statistics. News Release: Employer Costs for Employee Compensation--December 2008. USDL: 09-247. March 12,2009.

U.S. EPA, 2009. United States Environmental Protection Agency, Landfill Methane Outreach Program. LFG Energy Project Development Handbook, Chapter 4, Project Economics and Financing, pg. 4-3. Online Publication: Website Accessed, March 23,2009. http://epa.gov/lmoplres/pdf/pdh_chapter4.pdf

This Excel file with 5 spreadsheets, is part of Appendix F, STAFF REPORT: INITIAL STATEMENT OF REASONS FOR THE PROPOSED REGULATION TO REDUCE METHANE EMISSIONS FROM MUNICIPAL SOLID WASTE LANDFILLS

California Air Resources Board, Sacramento, CA

Description of Terms and Columns (also see Excel comment boxes on worksheets)

Name	Description
CO	County Number
AB	Air Basin Abbreviation
DIS	District Abbreviation
CIWMB SWIS File Number	California Integrated Waste Management Board (CIWMB) Solid Waste Information System (SWIS) ID
#	A number to indicate how many landfills are in that row (usually 1, but sometimes 2 or 3 may be grouped into a single row)
Facility/Site Name	From SWiS
Open Year	From SWiS or Survey, where it is red and in parenthesis,'it means this was not available and ARB estimated it.
Close Year	From SWiS or Survey
1990 W1P (Tons)	Cumulative Waste-In-Place (W1P) for all years up to 1990 in short tons (Tons)
2005 W1P (Tons)	Cumulative Waste-In-Place (W1P) for all years up to 2005 in short tons (Tons)
"Current" 2006 Control Type	Type of control for captured LFG (based on the most current 2006 CIWMB data or Survey data)'
2020 Reductions	Estimate of reductions from each landfill if they install gas collection with combustion as the control method

File Index	(Worksheet Tab Name)/Worksheet Title
	(Read Me)/This is the worksheet that you are now reading.
Worksheet 1	(Landfills_(All)/Total Number of CA MSW-Accepting Landfills
Worksheet 2	(Landfills_Controlled)/MSW-Accepting Landfills Forecast to be Subject to Control Requirements
Worksheet 3	(Cost_Subtotals)/Cost Subtotals
Worksheet 4	(Cost-Effectiveness)/Estimated Cost-Effectiveness
Worksheet 5	(Cost_Summary)/Cost Summary

Worksheet 1:

Total Number of CA MSW-Accepting Landfills

3/19/2009

Source: California Integrated Waste Management Board

Landfill Model CH4 Emissions (April 3, 2008)

CO	AB 1	DIS	CIWMB SWIS File Number	Count [a]	Facility/Site Name	Max. Waste Footprint (acres)	Open Year	Close Year	1990WIP (Tons)	2006WIP (Tons)	2020WIP (Tons)		
19	SC	SC	19-AK-0084	1	Paramount Dump	17.4	1921	1948	250,000	250,000	250,000		
19	SC	SC	19-AA-0580	1	Blanchard Street Dump	20	1931	1958	250,000	250,000	250,000		
19	SC	SC	19-AQ-0005 19-AQ-0014	2	BKK Carson	300	1948	1959	500,000	500,000	500,000		
37	SD	SD	37-AA-0026	1	Mission Bay Landfill #1	115	1952	1959	750,000	750,000	750,000		
19	SC	SC	19-AA-0581	1	Cogen	28	1951	1959	750,000	750,000	750,000		
19	SC	SC	19-AQ-0010	1	Garden Valley 1 and 2	20	1959	1959	3,000,000	3,000,000	3,000,000		
36	SC	SC	36-CR-0059	1	Waterman LF	24	1955	1960	300,000	300,000	300,000	2006	Combustion
30	SC	SC	30-AB-0356 30-AB-0359	2	Longsdon Pit	12	1957	1960	400,000	400,000	400,000		
19	SC	SC	19-AK-5004	1	City Dump & Salvage 2	8	1934	1961	75,000	75,000	75,000	2004	Venting
19	SC	SC	19-AK-5017	1	City Dump & Salvage 4	9	1934	1961	80,000	80,000	80,000	2004	Venting
30	SC	SC	30-AB-0166	1	Soarks-Rains LF	18	1934	1961	258,300	258,300	258,300	1999	Combustion
19	SC	SC	19-AR-1199	1	Branford LF	160	1957	1961	435,000	435,000	435,000		
19	SC	SC	19-AK-5003	1	City Dump & Salvage 1 & 3	100	1940	1961	1,000,000	1,000,000	1,000,000	1995	Combustion
37	SD	SD	37-AA-0027	1	Hillsborough	16	1935	1962	350,000	350,000	350,000	1996	Combustion
30	SC	SC	30-AB-0014	1	Gothard Street Landfill		[illegible]	[illegible]	[illegible]	813,200	813,200	2000	Venting
37	SD	SD	37-AA-0017	1	Duck Pond	2.5	1955	1963	25,000	25,000	25,000	1996	Combustion
19	SC	SC	19-CR-5517	1	Gaffey St.	17	1955	1963	900,000	900,000	900,000	2000	Carbon
19	SC	SC	19-AA-0778	1	Russell Moe Landfill	20	1947	1964	250,000	250,000.	250,000		
30	SC	SC	30-CR-0063	1	Lane Road Disposal Station 21	106	1961	1964	584,000	584,000	584,000		
34	SV	SAC	34-CR-5047	1	Elvas Avenue OS	10	1938	1965	75,000	75,000	75,000		
19	SC	SC	19-AQ-0016	1	Gardena Valley #6 (Don Kott Ford)	7.7	1938	1965	165,000	165,000	165,000	2000	Combustion
19	SC	SC	19-AR-5036	1	Gregg Pit/Pick-Your-Part	20	1938	1965	500,000	500,000	500,000	1993	Combustion
19	SC	SC	19-AQ-0012	1	Cal Compact/Metro LF	157	1959	1965	3,000,000	3,000,000	3,000,000	2000	Combustion
19	SC	SC	19-AA-5321	1	Torrance Municipal Dump	15	1959	1966	150,000	150,000	150,000		
30	SC	SC	30-CR-0020	1	Villa Park		1957	1966	200,000	200,000	200,000	1996	Combustion
37	SD	SD	37-CR-0088	1	Bell Jr. High/Sweetwater II	9	1959	1966	250,000	250,000	250,000	1994	Combustion
30	SC	SC	30-AB-0168	1	Newport Terrace LF	17	1940	1967	150,000	150,000	150,000	2004	Venting
19	SC	SC	19-AQ-0009	1	Southwest Conservation District LF	24	1941	1968	400,000	400,000	400,000	1995	Combustion
37	SD	SD	37-AO-0009	1	Old San Marcos	24	1941	1968	400,000	400,000	400,000		
42	SCC	SB	42-CR-Q015	1	Ballard Canyon	10	1942	1969	50,000	50,000	50,000		
21	SF	BA	21-AA-0047	1	Horst Hanf Landfill/Bayview Park	13.5	1942	1969	50,000	50,000	50,000	2004	Venting
37	SD	SD	37-AK-0006	1	MaxonSt.	15	1942	1969	150,000	150,000	150,000	1990	Combustion
37	SD	SD	37-AK-0001	1	Mission Ave. SLF	15	1942	1969	200,000	200,000	200,000	1990	Combustion
30	SC	SC	30-CR-0096	1	Cannery Street Disposal Station #16	20	1957	1969	496,584	496,584	496,584		
19	SC	SC	19-AR-5068	1	Bishop Canyon LF	45	1966	1969	1,660,000	1,660,000	1,660,000	2004	Venting
19	SC	SC	19-AA-5560	1	Industry Hills Sheraton Resort	131	1960	1969	3,500,000	3,500,000	3,500,000	1990	Combustion
31	SV	PLA	31-AA-0624	1	Rocklin Pit	3.9	1943	1970	10,000	10,000	10,000	2004	Venting
42	SCC	SB	42-CR-0014	1	Santa Ynez Airport LF	10	1945	1970	50,000	50,000	50,000	2006	Combustion
43	SF	BA	43-AN-0011	1	Hellyer Park LF	16	1943	1970	400,000	400,000	400,000	1998	Combustion
34	SV	SAC	34-AA-0023	1	Gerber Road LF	75	1944	1971	460,000	460,000	460,000		
56	SCC	VEN	56-AA-0125	1	Tierra Rejada	25	1945	1972	400,000	400,000	400,000		
41	SF	BA	41-AA-0003	1	Sierra Point	80	1945	1972	400,000	400,000	400,000	2004	Venting
9	LT	ED	09-CR-0015	1	Mevers LF	7.4	1946	1973	50,000	50,000	50,000		

Landfill Model CH4 Emissions IADril 3 2008\

CO	AB	DIS	CMMB SWIS File Number	Count a	Facility/Site Name	Max. Waste Footprint (acres)	Open Year b	Close Year	1990 WIP (Tons).	2006 WIP (Tons)	2020 WIP (Tons)	Year LFG. Capture	"Currenf' 2006 Control Type
37	SV	SAC	34-AA-Q016	1	14th Avenue Landfill (East/West Pits)	27	1946	1973	250,000	260,000	250,000	2004	Ventin Venting
37	SO	SO	37-AA-0033	1	So.uth MiramarSanitary'Landfill'122'-		1950	1973	3,000,000	3,000,000	3,000,000	1993	Combustic
37	SO	SO	37-AA-0429	1	ArizonaSt.	64	1952	1974	2,000,000	.2,000,000	2,000,000	1993.	Combustion
19	SC	SC	19-AA-0835	1	Sheldon-Arleta	42	1962	1974	5,500,000	5,500,000	5,500,000	1990	Combustion
21	SF	SA	21-AA-0049.	1	Hamilton AFB Landfill #26	20	1948	-197.5	100,000	100,000	100,000	2004	Venting
37	SO	SO	37-AA-0018	1	Poway	12	1948	1975	165,000	165,000165,000		1997	Combustion
37	SO	SO	37-M-Q019	-1	Gillespie	12	1948	1975	165,000	165,000	165,000	1997'--j'-	Combustion
19	SC	SC	19-AA-5350	1	City Of Santa Monica LF #2·	15	1948	1975	200,000	200,000	200,000	1999	Carbon
37	SO	SO	37-AA-0434	1	Paradise Park/Sweetwater III	20	1948	1975	200,000	200,000	200,000		
37	SO	SO	37-AH-0002	1	PalomarAiroort·	70	1962	1975	1,000,000	1,000,000	1,000,000	1995	Combustion
31	SV	PLA	31-AA-0220	1	Lincoln Disposal Site	6.3	1949	1976	50,000	50,000	50,000		
130	SC	SC	30-AB-0366	1	Forster Canyon Landfill	50	1958	1976	1,350,000	1,350,000	1,350,000		
19	SC	SC	19-AA-0011	1	Compton Disposal Site	17.9	1950	1977	200,000	200,000	200,000		
12	NC'	NCU	12-AA-0022	1	Table Bluff LF	20	1950	1977	200,000	200,000	200,000		
31	SO	SO	37-AA-0016	1	Encinitas	30	1967	1977	585,000	585,000	585,000	1997	Combustion
37	SO	SO	37-AA-0002	1	Valley Center	25	1951	.1978	130,000	130,000	130,000	1998	Combustion'
19	SC	SC	19-AA-0587	1	Longden Ave Disposal Site	54	1955	1978	1,000,000	1,000,000	1,000,000	1991-	Venting
37	SO	SO	37-AA-0001	1	Jamacha	46	1960	1978	1,800,000	1,800,000	1,800,000	1998	Combustion
19	SC	SC	19-AA-5100	1	CityofOuarteLF	17.2	1952	1979	200,000	200,000	200,000	1990	Combustion
36	SC	SC	36-AA-0005	1	Upland LF	34	1952	1979"	550,000	550,000	550,000	1993	Combustion
55	MC	TUO	55-AA-0005	1	Sierra Conservation Center	8	1953	1980	50,000	50,000	50,000		
31	MC	PLA	31-AA-0520	1	Meadow Vista LF	15	1965	'1980	100,000'	100,000	100,000	1997	Combustion
36	SC	SC	36-AA-0312	1	Norton AFB LF	25	1953	1980	250,000	250,000	250,000	2002	Combustion
31	SV	PLA	31-AA-0110	1	Roseville LF	21	1953	1980	300,000	300,000	300,000	2004	Venting
31	SV	PLA	31-AA-0310	1	Auburn Sanitarv Landfill	37	1953	1980	375,000	375,000	375,000		
34	SV	SAC	34-AA-0004	1	Elk Grove LF	37	1953	1980	450,000	450,000	450,000	1993	Combustion
31	SV	PLA	31-AA-0140	1	Loomis Landfill	25	1959	1980	500,000	'500,000	500,000	1997	Combustion
1	SF	BA	01-AA-0006	1	Davis Street	194	1965	1980	.4,800,000	4,800,000	4,800,000	1990-	Combustion
19	SC	SC	19-AE-0001	1	Palos Verdes.	291	1957	1980	23,600,000	23,600,000	23,600,000	1990 -	Combustion
19	SC	SC	19-AR-0003	1	Ascon Sanitarv LF	62	1960	1981	2,000,000	2,000,000	2,000,000	1995	Combustion
137	SO	SO	37-AA-0022	1	South Chollas	120	1952	1981	3,000,0003,006,000		3,000,000	1990	Combustion
			19-AA-0821	--									
19	SC	SC	19-AA-0822	3.	IMission Canyon/ Mountaingate								
			19-AA-0823			375	1958	1981	26,800,000	26,800,000	26,800,000	1990	Combustion
30	SC	SC	30-AB-Q026	1	City Of Huntinaton Beach Landfill	22	1955	1982	400,000	400,000	400,000	2004	Venting
31	MC	PLA	31-AA-Q540	1	Foresthill Sanitarv Landfill	4	1956	1983	50,000	50,000	50,000		
10	SJV	SJU	10-AA-0018	1	Rice Road Disposal Site	14.2	1956	1983	350,000	350,000	350,000	1998	Combustion
41	SF	BA	41-AA-0007	1	Junipero Serra Solid Waste DS	9	1956	1983	450,000	450,000	450,000	1991-	Combustion
33	SC	SC	33-AA-0002	1	West Riverside	74	1965	1983	1,000,000	1,000,000	1,000,000	1990	Combustion
1	SF	BA	01-AC-0001	1	Berkeley LFlWaterfront Park	90	1960	1983	1,000,000	1,000,000	1,000,000	1990'	Combustion
15	SJV	SJU	15-AA-0044	1	Bakersfield	115	1956	1983	2,000,000	2,000,000	2,000,000	2003	Combustion
37	SO	SO	37-AA-0901	1	Box'Canvon LF	120	1957	1984	500,000	500,000	500,000		
1	SF	BA	01-AA-0011	1	Albanv LF/East Shore Park	60	1964	1984	1,000,000	1,000,000	1,000,000	2000	Combustion
141	SF	BA	41-AA-0011 41-AA-0012	2	Marsh Road	146	1961	1984	3,500,000	3,500,000	3,500,000	1991	Combustion
19	SC	SC	19-AA-0836	1	Operating Industries (011) (NPL Site)	190	1948	1984	22,000,000	22,000,000	22,000,000	1995	Combustion
33	SC	SC	33-AA-Q001	1	TeauesauiteiCityofRiverside	120	1958	1985	2,400,000	.2,400,000	2,400,000	1995	Combustion
19	SC	SC	19-AR-0006	1	Penrose Pit	72	1960	1985	9,000,000	9,000,000	9,000,000	1990	Combustion
1	SF	BA	01-AA-0001	1	Turk Island Landfill	66	1965	1986	1,200,000	'-1,200,000	1,200,000	1990	Combustion
33	SC	SC	33-AA-0005_T-		Elsinore Landfill		1953	-1986	1,900,000	1,900,000	1,900,000.	1993	Combustion
19	SC	SC	19-Al-0001	1	Norwalk Dump,	13	1959	1986	100,000	563,842	3,135,162	2004	Venting
33	SC	SC.	33-AA-0004!	1	Corona Disposal Site	95	1961	1986'	4,000,000	'4,000,000	4,000,000'	1990	Combustion

CO	AB	DIS	CIWMB SWIS File Number	County[a]	Facility/Site Name	Max. Waste Footprint (acres)	Open Year[b]	Close Year	1990 WIP (Tons)	2006 WIP (Tons)	2020WIP (Tons)	Year LFG Capture	"Current" 2006 Control Type
19	SC	SC	19-AA-0819	1	Toyon	90	1957	1986	16,000,000	16,000,000	16,000,000	1990	Combustion
21	SF	BA	21-AA-0003	1	San Quentin Disposal Site	42	1960	1987	500,000	500,000	500,000	2004	Venting
48	SF	BA	48-AA-0001	1	Solano Garbage Company	36	1960	1987	750,000	750,000	750,000		
10	SJV	SJU	10-AA-0005	1	City of Fresno LF	145	1937	1987	4,700,000	4,700,000	4,700,000	2000	'Combustion
16	SJV	SJU	16-AA-0011	1	Corcoran LF	21	1961	1988	300,000	300,000	300,000		
40	SCC	SLO	40-AA-0009	1	Camp San Luis Obispo	8	1962	1989	50,000	50,000	50,000		
41	SF	BA	41-AA-0010	1	San Mateo Composting (3rd Ave.L	44	1962	1989	400,000	400,000	400,000		
54	SJV	SJU	54-AA-0002	1	Exeter OS	34	1962	1989	400,000	400,000	400,000		
56	SCC	VEN	56-AA-0004	1	Coastal LF (including Santa Clara LF)	120	1962	1989	4,000,000	4,000,000	4,000,000	1991	Combustion
31	MC	PLA	31-AA-05301		Clipper Creek LF	2	1963	1990	10,000	10,000	10,000		
5	MC	CAL	05-AA-0014	1	Red Hill SLF	15	1963	1990	100,000	100,000	100,000		
45	SV	SHA	45-AA-0021	1	Simpson Paper Company	20	1963	1990	400,000	400,000	400,000	2004	Venting
50	SJV	SJU	50-AA-0002	1	Geer Road LF	144	1963	1990	500,000	500,000	500,000	1991	Combustion
10	SJV	SJU	10-AA-0011	1	Sourtheast Regional	67	1970	1990	1,300,000	1,300,000	1,300,000	1998	Combustion
30	SC	SC	30-AB-001?	1	Coyote Canyon SLF	325	1963	1990	27,000,000	27,000,000	27,000,000	1990	Combustion
36	MD	MOJ	36-AA-0318	1	Mountain Pass Mine and Mill	4	1964	1991	20,000	20,000	20,000		
27	NCC	MBU	27-AA-0012	1	Lake San Antonio South Shore LF	5.5	1964	1991	25,000	25,000	25,000		
36	MD	MOJ	36-AA-0039	1	Newberry	4	1964	1991	25,000	25,000	25,000		
56	SCC	VEN	56-AA-0008	1	Pacific Missile TCLF	6	1964	1991	50,000	50,000	50,000		
15	SJV	SJU	15-AA-0056	1	Lebec LF	14.2	1987	1991	59,064	75,000	75,000	2004	Venting
50	SJV	SJU	50-AA-0003	1	Bonzi LF	35	1951	1991	536,258	773,200	966,220	1995	Combustion
18	NEP	LAS	18-AA-0003	1	Bieber LF	8	1951	1992	49,815	50,000	50,000		
28	SF	BA	28-AA-0003	1	Berryessa Garbage	7	1951	1992	47,955	50,000	50,000		
31	SV	PLA	31-AA-0120	1	Berry Street Mall LF	13	1965	1992	100,000	100,000	100,000		
48	SV	YS	48-AA-0004	1	Rio Vista	12	1951	1992	92,103	100,000	100,000		
7	SF	BA	07-AA-0003	1	Contra Costa SLF (aka GBF LF)	74	1943	1992	656,050	897,051	897,051	1995	Combustion
15	SJV	SJU	15-AA-0063	1	McFarland-Delano LF	40	1971	1992	918,766	1,000,000	1.000,000	2005'	Combustion
15	SJV	SJU	15-AA-0048	1	China Grade SLF	58	1978	1992	1,561,931	2,000,000	2.000,000	2002	Combustion
25	NEP	MOD	25-AA-0002	1	Eagleville	1.56	1966	1993	10,000	10,000	10,000		
25	NEP	MOD	25-AA-0003	1	Fort Bidwell	0.8	1966	1993	10,000	10,000	10,000		
25	NEP	MOD	25-AA-0004	1	Lake City	2.83	1966	1993	10,000	10,000	10,000		
25	NEP	MOD	25-AA-0021	1	Cedarville	2.09	1966	1993	10,000	10,000	10,000		
45	SV	SHA	45-AA-0022	1	Intermountain LF	4	1987	1993	13,466	25,000	25,000		
36	MD	MOJ	36-AA-0062	1	Lucerne Vlly	6	1977	1993	39,582	50,000	50,000		
19	SC	SC	19-AA-0057	1	Pitchess Detention Cntr	15	1975	1993	57,060	75,000	75,000		
36	MD	MOJ	36-AA-0026	1	Oro Grande	5	1966	1993	100.000	100,000	100,000		
49	NC	NS	49-AA-0004	1	Healdsburg	27	1966	1993	400,000	400,000	400,000	1994	Combustion
43	SF	BA	43-AO-0001	1	All Purpose LF	1.25	1965	1993	1,637,887	2,000,000	2,000,000	1990	Combustion
43	SF	BA	43-AA-0006	1	Shoreline-Mtn. View (Vista)	15o	1968	1993	1,973,885	2,000,000	2,000,000	1990	Combustion
47	NEP	SIS	47-AA-0030	1	Cecilville LF	1	1967	1994	10,000	10,000	10,000		
47	NEP	SIS	47-AA-0045	1	Hotelling Gulch LF	3	1967	1994	10,000	10,000	10,000		
47	NEP	SIS	47-AA-0029'	1	Kelly Gulch LF	1	1967	1994	10,000	10,000	10,000		
47	NEP	SIS	47-AA-0044	1	Rogers Creek LF	1	1967	1994	10,000	10,000	10,000		
36	MD	MOJ	36-AA-0059	1	Needles Sanitary LF	50	1964	1994	83,646	100,000	100,000		
23	NC	MEN	23-AA-0003	1	Casper Refuse OF	16	1964	1994	136,365	150,000	150,000	2004	Venting
31	MC	PLA	31-AA-0560	1	Eastern Regional LF	36	1978	1994	341,816	500,000	500,000	1994	Combustion
45	SV	SHA	45-AA-0019	L	Redding SLF (Benton)	71	1967	1994	750,000	750,000	750,000	1994	Combustion
44	NCC	MBU	44-AA-0003	1	Ben Lomond WDS	24	1942	1994	580,311	750,000	750,000	1994	Combustion
10	SJV	SJU	10-AA-0025	1	Chestnut Ave DS	32	1969	1994	670,038	1,000,000	1.000,000	1998	Combustion
1-41	SF	BA	41-AA-0009	1	Burlingham LF	41	1960	1994	1,009,000	1,000,000	1,000,000	1991	Combustion
39	SJV	SJU	39-AA-0003	1	Harney Lane LF	97	1948	1994	1,902,280	2,000,000	2,000,000	1993	Combustion
43	SF	BA	43-AA-0007	1	Sunnyvale LF	92	1960	1994	1,889,967	2,300,000	2,300,000	1991	Combustion

Landfill ModeLCH4 **Emissions** IAorii 3 2008\

Col	AB	DIS	CIWMB SWIS File Number	Count a	Facility/Site Name	Max. aste Footprint (acres)	Open Year b						
2008	SV	SAC	34-AA-0018	1	Sacramento City LF	130	1960						
	NEP	SIS	47-AA-0031	1	Lava Beds LF	1.24	1968						
				1	Wood SWDS	6.2	1987						
19	SC	SC	19-AA-0062	1	Two Harbors LF	2	1951						
47	NEP	SIS	47-AA-0035	1	New Tenant SWDS	10	1968						
47	NEP	SIS	47-AA-Q001	1	McCloud	12.5-	1951						
15	SJV	SJU	15-AA-0051	1	Glennville LF	4	1951						
49	NC	NS	49-AA-0002	1	AnnapOliS LF	5	1951						
58	SV	FR	58-AA-0002	1	Ponderosa SLF	10	1951						
6	SV	COL	06-AA-0001	1	Evans Rd LF-P1	14	1979						
39	SJV	SJU	39-AA-0005	1	Corral Hollow	43	1983						
33	SC	SC	33-AA-0008	1	Double Butte DS	100	1973						
47	NEP	SIS	47-AA-0026	1	Happy Camp SWDS	3.4	1969						
14	CBV	CBU	14-AA-0016	1	Furnace Creek	9.5	1951						
18	NEP	LAS	18-AA-0011	1	Herlong DF	8	1951						
36	MD	MOJ	36-AA-0058	1	Morongo DS	11.55	1982						
36	MD	MOJ	36-AA-0041	1	Trona Anaus LF	22	1951						
55	MC	TUO	55-AA-0002	1	Tuolumne Central (Jamestown)	16	1951						
10	SJV	SJU	10-AA-0002	1	Chateau Fresno LF	75	1950						
56	SCC	VEN	56-AA-0011	1	Bailard LF	120	1980						
30	SC	SC	30-AB-0018	1	Santiago Canyon SLF	130	1968						
19	SC	SC	19-AA-0820	1	Lopez Canyon LF	166	1975						
19	SC	SC	19-AF-0001	1	BKK West Covina (Class I and III LFs)	370	1962						
1D	NEP	LAS	1D-AA-nnn"	1	Madeline DF	1	1970						
18	NEP	LAS	18-AA-0005	1	Ravendale DF	1	1970						
40	SCC	SLO	40-AA-0014	1	California Valley LF	6	1970						
42	SCC	SB	42-AA-0010	1	New Cuyama	5	1970						
23	NC	MEN	23-AA-0008	1	Laytonville LF	7	1951						
36	MD	MOJ	36-AA-0049	1	Baker RDS	10	1951						
58	SV	FR	58-AA-0006	1	Yuba Sutter Disposal Area LF (YSDA	12	1951	1997	139,306	150,000	150,000		
58	SV	FR	58-AA-0001	1	Beale AFB LF	88	1951	1997	178,392	"200,000	-200,000	2004	Venting
15	MD	KER	15-AA-0055	1	Kern Valley LF	31	1984	1997	115,494	250,000	250,000	2004	Combustion
23	NC	MEN	23-AA-0021	1	City of Willits DS	18.5	1980	1997	144,672	250,000	250,000	2004	Venting
36	MD	MOJ	36-AA-0061	1	Lenwood-Hinkley	54	1951	1997	194,800	250,000	250,000		
36	MD	MOJ	36-AA-0060	1	Twentynine Palms DS	44.26	1983	1997	140,531	300,000	300,000"		
29	MC	NSI	29-AA-0001	1	McCourthey Rd LF	36	1972	1997	943,465	1,000,000	1,000,000	1991	Combustion
33	SS	SC	33-AA-0012	1	Coachella ValleY DS	75	1972	1997	1,494,459	2,500,000	2,500,000	2000	Combustion
58	SV	FR	58-AA-0005	1	Yuba Sutter Disposal Inc. LF (YSDI)	33	1967	1997	909,422	2,500,000	2,500,000	1999	Combustion
33	SC	SC	33-AA-0009	1	Mead Valley DS	60	1974	1997	1,315,088	2,528,951	2,528,951	1995	Combustion
37	SD	SD	37-AA-0008	1	San Marcos LF	107	1979	1997	2,483,568	6,000,000	6,000,000	1990	Combustion
36	MD	MOJ	36-AA-0084	1	Echo Gold	7	1971	1998	25,000	25,000	25,000		
54	SJV	SJU	54-AA-0010	1	Balance Rock DS	10	1971	1998	100,000	100,000	100,000		
15	SJV	SJU	15-AA-0047	1	Buttonwillow SLF	8	1951	1998	78,478	100,000	100,000		
21	SF	BA	21-AA-0002	1	West Marin SLF	15	1980	1998	113,958	200,000	200,000		
54	SJV	SJU	54-AA-Q001	1	Earlimart DS	16	1951	1998	149,620	200,000	200,000	2005-	Combustion
16	SJV	SJU	16-AA-0009	1	Hanford LF	79	1973	1998	1,159,295	1,750,000	1,750,000	2000	Combustion
33	SC	SC	33-AA-0003	1	Highgrove LF	71	1947	1998	1,284,218	3,002,920	3,002,920	1997-	Combustion
34	SV	SAC	34-AA-0007	1	Dixon Pit LF	29.75"-1	1982	1999	42,893	100,000	100,000	2004	Combustion
33	SC	SC	33-AA-0013	1	Anza DS	20	1977	1999	55,456'	100,000	100,000		
36	MD	MOJ	36-AA-0047	1	Yermo DS	12	1951	1999	83,254	-100,000	100,000		
39	SJV	SJU	39-AA-0002,	1	French Camp LF	60	1976	1999	230,325	517,575	517,575		

Landfill Model CH4 Emissions (ADril 3 2008\

CO	AB	DIS	CIWMB SWIS File Number	Count[a]	Facility/Site Name	Max. Waste Footprint (acres)	Open Year[b]	Close Year	1990 WIP (Tons)	2006 WIP (Tons)	2020 WIP (Tons)	Year LFG Capture	"Current" 2006 Control Type
23	NC	MEN	23-AA-0018	1	South Coast Rd LF	5	1973	2000'	28,186	50,000	50,000		
13	SS	IMP	13-AA-0012	1	Pichacho C&F	14	1951	2000	63,723	101,534	114,633		--
28	SF	BA	28-AA-0001	1	American Canyon LF	97	1940	2000	1,667,136	2,500,000	2,500,000	1990	Combustion
19	SC	SC	19-AA-0015	1	Spadra LF	173	1957	2000	10,144,050	17,536,915	17,536,915	1990	Combustion
47	NEP	SIS	47-AA-0027	1	Tulelake SWDS	8.8	1951	2001	52,216	75,172	75,172		--
36	MD	MOJ	36-AA-0056	1	Big Bear RDS	26	1988	2001	103,590	450,000	450,000		
42	SCC	SB	42-AA-0011	1	Foxen LF	18.4	1968	2001	430,090	750,000	750,000	2006.	Combustion
36	MD	MOJ	36-AA-0050	1	Hesperia RDS	50	1980	2001	432,133	750,000	750,000	2005	Combustion
23	NC	MEN	23-AA-0019	1	City of Ukiah SWDS	40	1967	2001	466,712	750,000	750,000	2004	Venting
36	SC	SC	3[illegible]-AA-00[illegible]4	1	Milliken LF	140	1956	2001	8,339,070	12,011,629	12,011,629	1990	Combustion
55	MC	TUO	55-AA-0001	1	Big Oak Flat LF	5	1972	2002	15,153	25,000	25,000	2002	Venting
54	SJV	SJU	54-AA-0011	1	Kennedy Meadows DS	6	1975	2002	25,000	25,000	25,000		
31	MC	PLA	31-AA-0550	1	Colfax LF	3	1975	2002	25,000	25,000	25,000		
47	NEP	SIS	47-AA-0003	1	Black Butte SWDS	27	1979	2002	67,285	149,564	149,564		
8	NC	NCU	08-AA-0006	1	Crescent City LF	23	1969	2002	270,268	505,963	665,340	2004	Venting
26	GBV	GBU	26-AA-0002	1	Bridgeport SLF	36.5	1951	2003	95,584	100,377	103,036		
27	NCC	MBU	27-AA-0003	1	Lewis Rd. LF	14	1978	2003	236,855	501,122	501,122	1997	Combustion
7	SF	BA	07-AA-0002	1	Acme Sanitary LF	109.	1954	2003	6,429,329	7,050,842	7,488,750	1991	Combustion
32	MC	NSI	32-AA-0007	1	Portola LF	8	1951	2004	62,497	75,000	75,000	2004	Venting
27	NCC	MBU	27-AA-0006	1	Jolon Rd LF	24	1979	2004	116,370	200,000	200,000.		
36	MD	MOJ	36-AA-0048	1	Apple Valley DS	38	1987	2004	103,544	300,000	300,000		
36	MD	MOJ	36-AA-0044	1	Phelan RDS	30	1983	2004	143,007	300,000	300,000		
3	MC	AMA	03-AA-0001	1	Amador Co. LF	29	1967	2004	401,174	737,602	742,369	2002	Combustion
43	SF	BA	43-AA-0004	1	Pacheco Pass LF	91	1963	2004	862,677	2,064,554	2,581,707	1994	Combustion
33	SS	SC	33-AA-0011	1	Edom Hill DS	148	1967	2004	1,681,856	6,983,228	12,733,398		Combustion
13	SS	IMP	13-AA-0005	1	Ocotillo C&F	5.3	1951	2005	19,588	25,000	25,006	2001	
45	SV	SHA	45-AA-0058	1	Twin Bridges	21	1981	2005	88,291	200,000	200,000		
13	SS	IMP	13-AA-0008	1	Brawley LF	34.3	1984	2005	122,389	430,327	699,366		
43	SF	BA	43-AN-0007	1	zan.kerR.d.LF	47.1	1956	2005	746,341	1,022,263	1,233,861	1995	Combustion
10	SJV	SJU	10-AA-0013	1	Orange Ave.	29	1941	2005	534,399	1,122,053	1,983,341	2006	Combustion
54	SJV	SJU	54-AA 0004	1	Teapot Dome DS	71	1972	2005	679,732	1,646,300	2,810,691	2005	Combustion
1	SF	SA	01-AA-0008	1	Tri-Cities LF	115	1968	2005	4,217,879	9,325,621	14,655,691	1990	Combustion
37	SD	SD	37-AA-0005	1	Ramona LF	46	1969	2006	791,182	1,642,804	2,883,292	1997	Combustion
19	MD	AV	19-AA-0009	1	Antelope Valley	57	1952	2006	269,364	3,743,346	9,607,924	2004	Combustion
36	SC	SC	36-AA-0051	1	Colton LF	82	1964	2006	1,587,376	6,062,952	11,840,853	2001	Combustion
7	SF	BA	07-AA-0001	1	W Contra costa LF	160	1953	2006	4,483,715	9,410,067	15,665,749	1992	Combustion
36	MD	MOJ	36-AA-0067	1	USMC- 29 Palms	38.5	1951	2007	94,772	163,838	273,517		
12	NC	NCU	12-AA-0005	1	Cummings Road LF	38	1969	2007	750,650	1,500,177	1,500,955	1997	Combustion
15	MD	KER	15-AA-0062	1	Tehachapi SLF	32	1973	2007	526,883	1,115,907	2,030,714		
36	MD	MOJ	36-AA-0046	1	Barstow RDS	47	1963	2007	835,445	1,645,120	2,949,622		
19	SC	SC	19-AR-0008	1	Bradley Ave East & West	171	1959	2007	12,983,834	33,518,023	38,729,613	1990	Combustion
13	SS	IMP	13-AA-0009	1	Niland C&F	13.9	1951	2008	46,552	51,211	60,735		
15	SJV	SJU	15-AA-0050	1	Arvin SLF	143	1971	2008	1,669,202	3,519,658	3,520,296	2001	Combustion
19	SC	SC	19-AR-0002	1	Sunshine Canyon City (Inactive Unit and Unit 2-1)	289	1958	2008	802,887	2,865,249	11,819,433	1992	Combustion
	SC	[illegible]	1[illegible]	1	Sunshine Canyon ExtenSiOn	[illegible]	[illegible]	2008	-2740746	[illegible]	[illegible]	1992	Combustion
24	SJV	SJU	24-AA-0002	1	Billy Wright LF	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
27	NCC	MBU	27-AA-0007	1	Crazy Horse I:F	72	1960	2009	1,189,474	4,000,135	7,943,988	1993	Combustion
41	SF	BA	41-AA-0008	1	Hillside LF	43	1968	2010	864,199	1,794,183	2,252,899'	2002	Combustion
13	SS	IMP	13-AA-0019	1	Republic-Imperial	73	1971	2010	279,924	1,856,219	4,108,951		
33	MD	SC	33-AA-0016	1	Desert Center DS	7	1951	2011	136,083	150,088	150,817		
33	SS	SC	33-AA-0071	1	Mecca Landfill II	19	1983	2011	65,942	205,591	252,464		
43	SF	BA	43-AM-0001	1	Palo Alto RDS	126	1954	2011	893,847	1,548,051	1,913,153	1993	Combustion
37	SD	SD	37-AA-0020	1	MiramarSWLF	470	1959,	2011	6,156,512	27,951,838	152,513,559	1995	Combustion

Landfill Model CH4 Emissions (ADrii 3 2008)

CO	AB	DIS	CIWMB SWIS File Number	Count [a]	Facility/Site Name	Max. Waste Footprint (acres)	Open Year [b]	Close Year	1990WIP (Tons)	2006WIP (Tons)	2020WIP (Tons)	Year LFG Capture	"Current" 2006 Control Type
21	SS	IMP	13-AA-00061		Holtville DS	24.5	1951	2012	100,652	150,014	150,358		
15	MD	KER	15-AA-0059	1	Ridgecrest SLF	91	1968	2012	734,267	1,632,378	2,660,395	2002	Combustion
40	SCC	SLO	40-AA-0004	1	Cold Canyon	88	1965	2012	1,321,918	3,827,673	6,599,415	1994	Combustion
19	MD	AV	19-AA-0050	1	Lancaster Waste Mgt.	209	1954	2012	1,253,944	4,921,267	12,577,703	1993	Combustion
15	MD	KER	15-AA-Q045	1	Boron SLF	14	1965	2013	115,269	206,829	261,924		
36	MD	MOJ	36-AA-0057	1	Landers DS	42	1986	2013	201,694	936,892	2,324,132		
45	SV	SHA	45-AA-0043	1	West Central (Phase 2)	100	1990	2013	106,919	2,101,253	4,581,004		
34	SV	SAC	34-AA-0020	1	L & D LF	157	1977	2013	1,239,834	3,565,900	7,739,980	2004	Venting
30	SC	SC	30-AB-0035	1	Olinda Alpha SLF	420	1960	2013	14,557,799	45,305,372	86,102,427	1990	Combustion
19	SC	SC	19-AA-0053	1	Puente Hills LF	640	1957	2013	55,110,679	116,141,687	185,036,763	1990	Combustion
15	MD	KER	15-AA-0058	1	Mojave-Rosamond SLF	27	1967	2014	279,771	521,676	689,218		
19	SC	SC	19-AA-0012	1	Scholl Canyon LF	440	1961	2014	19,443,400	27,791,673	36,374,233	1990	Combustion
40	SCC	SLO	40-AA-0002	1	Camp Roberts SWDS	11.7	1951	2015	67,395	100,000	100,000		
9	MC	ED	09-AA-0003	1	Union Mine DS	21.8	1962	2015	1,101,623	1,502,320	1,523,377	1997	Combustion
32	MC	NSI	32-M-0008	1	Gopher Hill LF	13	1974	2016	43,553	75,000	75,000		
36	SC	SC	36-AA-0087	1	San Timoteo SWDS	114	1978	2016	773,034	3,200,222	6,832,341	2000	Combustion
1	SF	BA	01-AA-0010	1	Vasco Road LF	222	1962	2016	3,990,878	11,845,745	21,368,916	1996	Combustion
43	SF	BA	43-AN-0003	1	Newby Island	313.2	1932	2016	2,409,383	15,746,481	28,339,271	1992	Combustion
37	SD	SD	37-AA-Q023	1	Sycamore SW LF	324	1976	2016	2,984,513	14,111,841	31,614,97?	1999	Combustion
42	SCC	SB	42-AA-0016	1	City of Santa Maria LF	245	1940	2017	1,217,394	3,247,271	5,338,263	1998	Combustion
33	SC	SC	33-AA-0006	1	Badlands DS	150	1966	2018	674,139	6,768,638	19,976,773	2001	Combustion
13	SS	IMP	13-AA-0011	1	Salton Citv C&F	7.8	1951	2019	47,770	50,740	61,849		
33	SS	SC	33-AA-0015	1	OasisDS	26	1951	2019	61,554	100,005	100,056		
50	SJV	SJU	50-AA-0001	1	Fink Rd LF	216	1973	2019	706,220	2,793,994	5,158,987	2004	Combustion
49	SF	BA	49-AA-0001	1	Central LF	172	1972	2019	4,585,243	11,192,029	14,126,201	1990	Combustion
19	SC	SC	19-AA-0052	1	Chiquita Canyon	257	1972	2019	4,310,480	22,074,046	50,973,493	1995	Combustion
28	SF	BA	28-AA-0002	1	Clover Flat LF	44	1984	2020	226,887	836,580	1,589,315		
16	SJV	SJU	16-AA-0004	1	AvenaILF	123.2	1980	2020	341,069	1,136,419	4,003,699		
43	SF	BA	43-AN-0015	1	Guadalupe SLF	115	1929	2020	1,034,929	4,469,114	7,922,634	1990	Combustion
42	SCC	SB	42-AA-0015	1	Tajiguas LF	118	1967	2020	2,654,471	6,235,959	10,283,897	1996	Combustion
39	SJV	SJU	39-AA-0015	1	Forward LF (+ Austin Rd LF -000n	354.5	1973	2020	1,973,144	15,264,704	37,950,388	1991	Combustion
37	SD	SD	37-AA-Q006	1	Borrego Springs LF	29	1951	2021	195,604	264,301	373,372		
15	MD	KER	15-AA-0150	1	Edwards AFB Main LF	64	1978	2021	127,252	319,450	476,764		
11	SV	GLE	11-AA-0001	1	Glenn County LF	50	1976	2021	342,393	797,154	1,189,403		
44	NCC	MBU	44-AA-0004	1	Buena Vista DS	61	1966	2021	1,321,475	3,250,261	5,415,161	1991	Combustion
37	SD	SD	37-AA-0010	1	OtaySWLF	230	1963	202f	7,065,578	21,650,229	50,092,469	1991	Combustion
13	SS	IMP	13-AA-0001	1	Imperial SWS	18	1951	2022	96,720	152,424	172,869		
13	SS	IMP	13-AA-0004	1	Calexico DS	38	1951	2022	344,144	502,436	524,483		
56	SCC	VEN	56-AA-0007	1	Simi Vallev LF	185.61	1970	2022	4,946,498	13,739,823	27,823,257	1991	Combustion
30	SC	SC	30-AB-0360	1	Frank R. Bowerman	341	1989	2022	6,541,179	36,445,683	75,897,049	1993	Combustion
26	GBV	GBU	26-AA-0004	1	Benton Crossina	71.51	1988	2023	58,764	382,077	1,005,138		
44	NCC	MBU	44-AA-0002	1	City of Watsonville	31	1962	2023	583,714	1,080,517	1,734,443	1997	Combustion
52	SV	TEH	52-AA-0001	1	Red BluffLF	33.6	1956	2023	400,561	1,111,250	2,013,981	2005	Combustion
16	SJV	SJU	16-AA-0021	1	Kettleman Hills SLF	43	1998	2023	0	1,685,025	5,488,215	2005	Combustion
33	SC	SC	33-AA-0007	1	Lamb Canyon DS	144.6	1970	2023	1,350,362	5,092,563	14,048,887	2002	Combustion
41	SF	BA	41-AA-0002	1	Corinda Los Trancos LF (Ox Mtn)	191	1976	2023	3,102,621	16,593,446	29,255,388	1991	Combustion
35	NCC	MBU	35-AA-0001	1	John Smith Road SWDS	44	1968	2024	712,443	1,667,101	2,905,134	1998	Combustion
54	SJV	SJU	54-AA-0009	1	Visalia DS	247	1952	2024	786,444	2,967,791	4,782,022	2004	Combustion
43	SF	BA	43-AN-0008	1	Kirby Canyon LF	311	1986	2025	1,775,249	6,608,275	11,149,364	1996	Combustion
40	SCC	SLO	40-AA-0008	1	Chicago Grade	36.25	1986	2026	203,666	920,660	2,305,490	2006	Combustion
54	SJV	SJU	54-AA-0008	1	Woodville DS	153	1970	2026	1,258,544	2,644,186	3,755,863	2004	Combustion
13	SS	IMP	13-AA-0010	1	HotSpaC&F	6	1951	2027	45,381	50,699	56,431		
18	NEP	LAS	18-AA-0010	1	Westwood DF	9	1951	2027	38,440	52,494	78,294		
17	LC	LAK	17-AA-0001	1	Eastlake SLF	35	1960	2027	364,723	1,104,817	1,935,182		

Landfill Model CH4 Emissions (April 3. 2008)

CO	AB	DIS	CIWMB SWIS File Number	Co.nt'	Facility/Site Name	Max. Waste Footprint (acres)	Open Year	Close Year	1990 WIP (Tons)	2006WIP--- (Tons)	2020 WIP (Tons)	Year LFG Capture	"Current" 2006 Control Type
15	SJV	SJU	15-AA-0057	1	Shafter-Wasco SLF	135	1972	2027	1,141,979	3,043,121	5,665,322	2002	Combustion
56	SCC	VEN	56-AA-0005	1	Toland Rd. LF	92	1970	2027	675,668	4,692,098	11,982,793	1997	Combustion
25	NEP	MOD	25-AA-0001	1	Alturas	27.5	1984	2028	46,952	100,000	100,000		
18	NEP	LAS	18-AA-0009	1	Bass Hill LF	32	1986	2028	79,828	348,082	737,637		
19	SC	SC	1-9-AA-0056	1	Calabasas LF	416--1--	1961	2028	13,172,817	22,479,153	31,874,338	1990	Combustion
1	SF	BA	01-AA-0009	1	Altamont LF	443	1980.	2028	14,.967,744	39,772,442	63,607,251	1990	Combustion
13	SS	IMP	13-AA-0007	1	Palo Verde C& F	9.41951		2029	49,728	50,010	50,132		
10	SJV	SJU	10-AA-0006	1	Coalinaa OS	52	1970	2029	270,061	525,688	758,692		
10	SJV	SJU	10-AA-0004	1	Clovis LF	50	1969	2029	454,816	1,102,938	1,934,418	2006	Combustion
33	SC	SC	33-AA-0217	1	El Sobrante SWLF	495	1983	2030	1,619,035	19,711,183	59,173,030	1994	Combustion
40	SCC	SLO	-,f0-AA-0001	1	Paso Robles LF	66.	1970	2031	974,622	1,597,969	2,416,280	1997	Combustion
36	SC	SC	36-AA-0017	1	California St. LF	106	1963	2031	760,853	1,627,494	2,670,268	2001	Combustion
10	SJV	SJU	10-AA-0009	1	American Ave.	361	1971	2031	2,260,008	8,990,687	16,983,923	2000	Combustion
19	SC	SC	19-AA-0063	1	US Navy LF (San Clemente Island)	13	1951'	2032	35,407	51,662	64,244		
18	NEP	LAS	18-AA-0013	1	Sierra Army Depot	32	1951	2032	78,230	100,000	100,000		
46	MC	NSI	46-AA-0001	1	Loyalton LF	29	1974	2032	37,536	82,007	134,022		
57	SV	YS	57-AA-0004	1	UC Davis LF	53	1974	2032	149,286	325,625	539,213	1996	Combustion
5	MC	CAL	05-AA-0023	1	Rock Creek LF	57	1990	2032	5,326	576,705	1,452,714		
19	SC	SC	19-AA-0061	1	Pebbly Beach	5.6	1982	2033	17,751	56,903	113,846		
33	MD	MOJ	33-AA-0017	1	Blythe DS	78	1969	2033	415,345	795,266	1,190,551	1997	Combustion
20	SJV	SJU	20-AA-0002.	1	Fairmead LF.	77	1958	2033	661,128	2,309,543	4,781,653	1998	Combustion
39	SJV	SJU	39-AA-0022	1	North County LF	185	1990	2033	94,996	2,161,867	5,090,525		
4	SV	BUT	04-AA-0002	1	Neal RD LF	140	1970	2033	493,221	3,100,082	6,086,556	2002	Combustion
36	SC	SC	36-AA-0055	1	Fontana ROS (Mid-Valley	408	1958	2033	2,466,265	9,786,714	25,197,761	1995	Combustion
34	SV	SAC	34-AA-0001	1	Kiefer LF	667	1967	2035	4,882,713	17,499,572	30,055,405	1994	Combustion
26	GBV	GBU	26-AA-0003	1	Pumice Valley	20	1951	1-2036	123,153	150,755	156,182	-	
31	SV	PLA	31-AA-0210	1	Western Regional LF	231	1980.	2036	1,201,867	4,538,046	9,086,821	1993	Combustion
44	NCC	MBU	44-AA-0001	1	City of Santa Cruz LF	57.5	1966	2037	793,897	1,869,373	2,844,784	1991	Combustion
7	SF	BA	07-AA-0032	1	Keller Canyon LF	244	1992	2037.	0	7,678,238	22,690,827	1993	Combustion
15	SJV	SJU	15-AA-0052	1	Lost Hills SLF	25	1951	2038	72,069	100,000	100,000		
14	GBV	GBU	14-AA-0004	1	Independence OS	18.42	1951	2038	91,998	104,469	131,998		
15	SJV	SJU	15-AA-0273	1	Bakersfield SLF (Bena)	229	1992	2038	0	4,757,447	13,408,350	2000	Combustion
19	SC	SC	19-AH-0001	1	Whittier- Savage Canyon	132	1963	2039	3,027,749	6,176,012	7,618,193	1993	Combustion
21	SF	BA	21-AA-0001	1	Redwood SLF	195	1958	2039	1,960,908	8,286,636	15,476,521	1990	Combustion
27	NCC	MBU	27-AA-0005	1	Johnson Cnyn LF	80	1976	2043	148,946	993,345	2,254,724	2000	Combustion
24	SJV	SJU	24-AA-0001	1	Hwy 59 DS	255	1972	2043	1,322,411	3,973,714	7,847,858		
32	MC	NSI	32-AA-0009	1	Chester LF	28	1973	2045	27,272	50,221	52,389		
57	SV	YS	57-AA-0001.	1	Yolo Co. Central LF	473	1975	2045	2,777,248	5,833,578	9,244,718	1992	Combustion
42	SCC	5B	42-AA-0017	1	Lompoc LF	39	1962	2047	259,256	1,119,417	2,068,142	2002	Combustion
45	SV	SHA	45-AA-0020	1	Anderson LF	165	1976	2049	550,274	2,063,459	4,647,695	2006	Combustion
14	GBV	GBU	14-AA-0007	1	Tecopa DS	9.3	1978	2050	50,000.	50,000	50,000		
53	NC	NCU	53-AA-0013	1	Weaverville LF	16.6	1976	2050	85,831	150,000	150,000		
14	GBV	GBU	14-AA-0006	1	Shoshone OS	4.7	1978.	2052	25,000	25,000	25,000		
19	SC	SC	19-AA-0040	1	Burbank LF #3	49	1971	2053	611,532	1,330,610	2,005,216	1995	Combustion
14	GBV	GBU	14-AA-0005	1	Bishop Sunland	69.2	1983	2054	82,061	299,731	597,518		
39	SJV	SJU	39-AA-0004	1	Foothill LF	50	1965	2054	551,014	4,123,926	Q158,468		
36	MO	MOJ	36-AA-0045	1	Victorville RDS	341	1955	2059	1,067,804	4,348,479	10,626,492	2003	Combustion
48	SF	SA	48-AA-0075	1	Potrero Hills	190	1986	2059	574,163	8,521,148	24,710,972,	1993	Combustion
6	SV	COL	06-AA-0002	1	Stonyford LF	3.3	1951	2064	9,381	1n 788	17,296		
47	NEP	SIS	47-AA-0002	1	Yreka LF	52	1984	2065	00,700	231,036	451,0r2		
58	SV	FR	58-AA-0011	1	Ostrom Road SLF	225	1995	2066	0	1,663,897	6,125,580	2003	Combustion
30	SC	SC	30-AB-0019	1	Prima Descha SLF	699	197A	9067	12,035,917	?1,893,121	36,376,606	1991	Combustion
48	SV	YS	48-AA-0002	1	B & J Drop Box	260	1964	2070	1,529,609	3,911,14	7,168,617		
22	MC	MPA	22-AA-0001	1	Mariposa Co. SLF	40	1974	2081	149,274	330,547	562,699		

Landfill Model CH4 Emissions fADrii 3 20081

CO	AB	DIS	CIWMB SWISFile Number	Count"	Facility/Site Name	Max. Waste Footprint (acres)	Open Year b	Close Year	1990WIP (Tons)	2006WIP (Tons)	2020WIP (Tons)	YearLFG Capture	"Current" 2006 Control type
42	SCC	SB	42-AA-Q012	1	Vandenburg AFB	172	1978	2084	133,140	340,242	480,687		
27	NCC	MBU	27-AA-0010	1	Monterev Peninsula LF	315	1966	2084	3,981,093	7,517,740	11,570,780	1990	Combustion
14	GBV	GBU	14-AA-0003	1	Lone Pine OS	26.6	1951	2087	69,767	107,801	164,761		
15	SJV	SJU	15-AA-Q061	1	TaftSLF	85	1972	2123	568,630	1,083,515	1,644,864	2005	Combustion
26	GBV	GBU	26-AA-Q005	1	Chalfant SLF	6.6	1951	2155	49,934	50,000	50,000		
26	GBV	GBU	26-AA-0001	1	WaikerSLF	38.4	1951	2162	45,94.2	50,324	52,343		
37	SO	SO	37-AA-0903	1	Las Pulgas LF	88.7	1979	2184	321,545	833,131	1,486,508		
26	GBV	GBU	26-AA-0006	1	Benton SLF	7.4	1978	2212	77,607	100,000	100,000		
37	SO	SO	37-AA-0902	1	San Onofre LF	31	1951	2257	100,406	151,309	158,618		
36	MO	MOJ	36-AA-0068	1	Fort Irwin	467	1970	2405	137,707	264,636	383,515		
			TotalCA MSW Landfills by SWIS#	372	367 Landfills bv Facility/Site Name				618,564,139	1,231,428,174	1,970,372,763		

" Some facilities are composed of more that one SWIS # and were evaluated as a single facility for emission inventory and cost analyis purposes.

b Open Year in Bold Indicates ARB Estimate

Worksheet 2 MSW-Accepting Landfills Forecast to_be Subject to Control Requirements

5/7/2009

No.	Basin	Dist.	SWIS No.		Name	Ownership		Average Rainfall (Inch/Y	Open Year	Close Year	1990 WIP (tons)	2006 WIP (tons)	2020 WIP (tons)	Year							2010 Gas Heat Cl p. C.1e	Final Gas Heat Calc. Year	Max. Rate CMM BTU/HR)	Capital Cost of Control	Annualized Capital Cost	Assumed Start Year for Cap Cost Amort.	Assumed End Year for cap. Cost Amort.
								39	'''7	2001	466,712	750000	750,000								2010	2010	3.3	$781.000	$75,210	2011	2026
7	SF	BA	07-AA-0003			Private	74	15	1943	1992	656,050	897,051	897,051	1995	Combustion	1988	2010	Controls	No		2010 I	2010	3.3		$0	2013	
10	SJV	SJU	10-AA-0025	1	Chestnut Ave OS	Private	32	.1L_	'969	'994	670,038	1,000,000	1,000,000	1998	Combustion	'988	2010	Controls	No	C	2010	2010	12.9			2013	2028
41	SF	BA	41-AA-0009	1	Burlingham LF	Local Govt.	41	23	1960	1994	1000000	1,000,000	1000000	1991	Combustion	1975	2010	Controls	No	Clo	2010	2010	32			2013	2028
29	Me	NSI	29-AA-0001	1	McCourtney Rd LF	Local Govt.	36	53	1972	1997	943,465	1000000	1,000,000	1991	Combustion	1980	2010	Controls	No	C	2010	2010	3.6		$0	2013	2028
11	S	GIE	11-AA-0001	1	Glenn County LF	Local Govt.	50	19	1976	2021	342,393	797154	1,189,403			1991	2010	Controls	CoII.+Cntl.	0 n	1	2021	3.4	$970,000	$93,411	2012	2027
33	MD	MOJ	33-AA-0017	1	Blythe DS	Local Govt.	78		1989	2033	415,345	795,	1,190,551	1997	Combustion	1992	20IQ	Controls	No	0 n	2033	2033	32		$0	2012	2027
1	SF	BA	01-AA-0001	1	Turk Island Landfill	Private	ıı	17	1965	1986	1,200,000	1,200,000	000	1990	Combustion	1973	2010	Controls	No						$0	2012	2027
43	SF	BA	43-AN-0007	1	Zanker Rd. LF	Private	47.1	15	1956	2005	746,341	1,022,263	1,233,861	1995	Combustion	1981	2010	Controls	No						$0	2012	2027
10	SJV	SJU	10-AA-0011	1	Southeast Regional	Local Govt.	67	1,,	1970	1990	1,300,000	1.300.000	1,300,000	1998	Combustion	1977	2010	Controls	No	Closed	2010	2010	4.0		$0	2012	2027
						Local Govt.	57	19	1990	2032	5,326	576,705	1,452,714			2003	2010	Controls	Coll. + Cntl.	Open	2032	2032	4.3	$1,102,3001	$106.151	2011	2026
						Military	88.7	13	1979	2184	321,545	833,131	1,486,508			1993	2010	Controls	Coll. + Cntl.	,n 1	2184	2033 I	4.3	$1.701,4301	$163,848	2012 I'	2027
					Cummings Road LF	Local Govt.	38	49	1969	2007	750,650	1,500,177	1,500,955	1997	Combustion	1986	2010	Controls	No	Closed	2010	2010	8.2		$0	2013	2028
9	MC	ED	09-AA-0003		Union Mine DS	Local Govt.	21.8	35	1962	2015	1,101,623	1,502,320	1,523,377	1997	Combustion	1973	2010	Controls	No	'n	2015	.2015	5.9		$0	2011	2026
28	SF	BA	28-AA-0002	1	Clover Flat LF	Private	44	311	1984	2020	226,887	1 636,580	1.589.315			'997	2010	Controls	Coll. + Cntl	,n	2020	2020	6.9	$656,600	,491	2012	2027
15	SJV	SJU	15-AA-0061	1..	Tan.SIF.	Local Govt	85	7	,an	2123	568,630	1,083,515	1.644.864	20051	Combustion	1980	2010	Controls	No	in	2123 1	2033	5.8		$0	2012	2027
44	NCC	MBU	44-AA-0002	1	City of Watsonville	Local Govt.	31	25	1962	2023	583,714	1 080 517	1,734,443	1997	Combustion	1985	2010	Controls	INo	In 1	2023	2023	,,,			2011	2026
16	SJV	SJU	16-AA-0009	1	Hanford LF	Local Govt.	79	9	1973	1998	1,159,295	1,750,000	1,750,000	2000	Combustion	1980	2010	Controls	No		2010	2010	6. 1		$0	2012	2027
37	SD	SD	37-AA-0001		Jamacha	Local Govt.							1,800,000	1998!	Combustion	1964	2010	Controls	INo	Close	2010	20JO_	4.3			2012	2027
33	SC	SC				Local Govt.	44						1,900,000	1993\	Combustion	1963	2010	Controls	No		2010	2010	4.9			2012	2027
43	SF	BA	43-AM-0001	1..	Palo Alto RDS	Local Govt.	126	15	1954	2011	693,847	1,548,051	1,913,153	1993	Combustion	1982	2010	Controls	No		2011	2011	5.5		$0	2012	2027
10	SJV	SJU	10-AA-0004	1..	Clovis LF	Local Govt.	50	13	1969	2029	454,816	1,102,938	1,934,418	2006	Combustion I	1989	2010	Controls	INo	01		2029	5.6			2012	2027
17	I 1C	lLAKI	17-AA-0001	1..	Eastlake SLF	Local Govt.	35	29	1960	2027	364,723	1104817	1,935,182			1991 I	2010	Controls	Coll. + Cntl.	nl	2027 !	2027 I	8.1	500	$66,110	2012	2027
10	SJV	SJU	10-AA-0013	1	Orange Ave.	Private	29	11	1941	2005	534,399	1,122,053	1,983,341	2006	Combustion	1985	2010	Controls	No		2010	2010	5.4		$0	2012	2027
					Ascon Sanitary LF	Private	62	13	1960	'98'	2,000,000	2,000,000	2,000,000	1995	Combustion	1984	2010	Controls	No		2010	2010	5.0			2Ot3.	2028
					Bakersfield	Local Govt.	115	7	1956	1983	2,000,000	2,000,000	2,000,000	2003	Combustion	1983	2010	Controls	No	Close	2010	2010	5.0		$0	2011	2026

Analysis Year

Name	Annual Operation & Mtce Cost	Surface Monitoring & Cover Maintenance (Cost/Test)	Annual Monitoring Frequency	2010	2011	
	$193,000	".950	$63,802 127	$75 10 $193000 $15802		
07-AA-0003	Exl	57.309	;127		577.	$0 Existing 529,
Chestnut Ave OS	Ex	$3,160	127		$60,641	Ex, $12,641
Burlingham LF	Exl'	$4,049	127		197!	$0 Existing .$16,197
McCourtney Rd LF	Existi	".555	127		$62,221	$0 Exl $14,221
Glenn County LF	$235,000	".93B	$127	$67,752 $f27	$93,411 $235 000 $19752 $121	$93,411 $235 000 19752 127 SO
Blythe DS	Ex	57.703	127	$78,813 ;127	Ex $30813 $127	Ex $30,813 $127 SO
Turk Island Landfill	Ex,	$6,518	127	$74,073	Existi 526.073	Exi $26,073
Zanker Rd. LF	Ex'	$4,652	'27	....IIOII	SO Ex' $18,606	$0 Existing $18,606
Southeast Regional	Existi	$6,617	$127	'4,468	$0 Existing S2II,468	$0 Ex; $26,468
Local Govt. (57)	,400	ıı	$70,517 $127			
Military	S397.	$6,760	127	.040 127		
Cummings Road LF		$3,753	;127		$63,012	
Union Mine DS	Ex;	,53	$58,612 $127	SO Exl $8,612 $127		
Clover Flat LF	$209,	".345	"27	382 ,127		
Tan.SIF.	Existi	".39S	$127			
City of Watsonville	Exl	$3,062	$60,246 127			
Hanford LF	Exl	57,902	,127	579.		
Jamacha	Exl	$4,543	127	$66,172	$0 Existing $18,172	
33 SC	Existi	1,073	'27		Ex $4,291	$4,291
Palo Alto RDS	Exl	$12,444	.127	$97,775 "27	$0 Existing $49,775	$0 Existing $49,775
Clovis LF	Exl	".93B	"27	$67,752 127	SO Existi $19752· 127	SO Ex $19752 127
Eastlake SLF	$172,000	$3.457	"27	$61,626 .127	$66,110 $172000 13,826 127	$66,110 $172,000 $13,826
Orange Ave.		52	127	$59,456	SO Ex $11458	SO $11456
Ascon Sanitary LF	Ex,	:1,512	-$127		$54,046	
Bakersfield	Exl	$11,357	4. $93,430	SO Exl	SO Exl	SO

Analysis Year

CO	AD	DIS	CIWMB SWIS File Number	County	Facility/Site Name	Ownership Status	Max. Waste Footprint (acres)	Average Rainfall (inch/Yr)	Open Year	Close Year	1990 WIP (Tons)	2008 WIP (Tons)	2020 WIP (Tons)	Year LFG Capture	Updated Control Type (2009)	Year >= 450,000 Tons WIP	Effective Year of Control (WIP Criteria)	Gas Heat Rate Calc. Test?	New Hardware?	2010 Status	Gas Heat Cap Calc	Final Gas Heat Calc. Year	Max. Gas Rate (MM BTU/HR)	Capital Cost of Control (lump sum)	Annualized Capital Cost	Assumed Start Year for Cap Cost Amort.	Assumed End Year for Clp. Cost Amort.	Annual Operation & Mtce Cost	Surface Monitoring & Improved Cover Maintenance (Cost/Test	Annual Monitoring Fre	2010	2011	2012	2013
40	SJVI	SJU	15-AA-0048		China Grade SLF	Local Govt.	58		1978	1992	1.561.931	2,000,000	2.000.000	2002	Combustion	1980	2010	Controls	No		2010	2010	5.0		sol	2013	2028	Existing	$5,728		$127			$0 Existi $22.9121
43	SF	BA	43-AC-0001		All Purpose LF	Local Govt.	25	'5	'90S	1993	1.637.887	2.000.000	2,000,000	1990	Combustion	1976	2010	Controls	No	Clo	2010	2010	6.7		sol	2012						$70,912	$0 Exi 59.876	$0 Ex 59.876
43	SF	SA	43-AA-0006		Shoreline-Mtn. View	Local Govt.	150	'7	1***	1993	1.973.885	2.000.000	2.000.000	1990	Combustion	1972	2010	Controls	No		2010	2010	6.0		sol								$0 Exi $59,256	$0 Ex $59,
39	SJVI	SJU	39-AA-0003		Lane LF	Local Govt.	97	17	1948	1994	1	2,000,000	2.000.000	19931	Combustion	1966	2010	Controls	No		2010	2010	5.6		SOI	2013	2028	Existing	$9,580		$127		$56,319	$0 Existing $38,319
19	SC	Se	19-AA-0040		Burbank LF #3	Local Govt.	49	.9	1971	2053	611	1.330.810	,003.218	19951	Combustion	1986	2010	Controls	No	Open	2053	2033	5.6		sol	2011	2026	Exi	$1.195		$52,778 127	$4,778 127	Existing $4,778 $127	Existing $4,778 5127
52	Sv	TEH	52-AA-0001		Red Bluff LF	Local Govt.	33.6	23	1956	2023	400,561	1.111.250	2,013,961	2005	Combustion	1991.'	2010	Controls	INa	Open	2023	2023	6.3		sol	2012	2027	Existing	$3,318		$127	$61,273 $127	$0 Ex $13 3 $127	$0 Ex $132731 $127
",sl	MD	KER	15-AA-0062		Tehachapi SLF	Local Govt.	32	11	1973	2007	526,883	1.115.907	2,030,714		Open Flare	1991	2010	Controls	Encl. Flare	Cl	2010	2010	5.5	$284,	$27,406	2018	2033	$159,400	$3,160					
42	Isecl	sa	42-AA-0017		LF	Local Govt.	39	17	1962	2047	259,256	1,119,417	2,068,142	120021	Combustion	1994	2010	Controls	No	Open	2047	2033	5.5		sol	2011	2026							
24	SJV	SJU	24-AA-0002		LF	Local Govt.	40		1973	2009	274,746	1,124,901	2,158,303			1995	2010	Controls	Coll. + Cntl.	Closed	2010	2010	6.3	$781,000	$75,210	2011	2026	$193.000		$127	$127	$127	$127
41	SF	BA	41-AA-0008		Hillside LF	Private	43	23	1968	2010	864,199	1,794,183	2,252,899	2002	Combustion	1951	2010	Controls	!Na		2010	2010	6.9		sol	2013	2028	Existing						
27	INeel	Maul	27-AA-0005		Johnson enyn LF	Local Govt.	50	'3	1976	2043	148,946	993,345	2,254,724	2000	Combustion	1998	2010	Controls	No		2043	2033	5.6		sol	2011	2026	Exist						
43	SF	BA	43-AA-0007		Sunnyvale LF	Local Govt.	92	'5	1960	1994	1,889,967	300,000	2.300.000	1991	Combustion	1973	2010	Controls	No	Cl	2010	2010	7.5		sol	2012	2027	Exist	$9,086		$127			
40	Isecl	SIO	40-AA-0008		Chicago Grade	Private	36.25	'9	1988	2026	203,666	920,660	2.305.490	2006	Combustion	1999	2010	Controls	INo	Open	2028	2026	6.6		sol	2011	2026	Existing	$3,590		$52,320 127	$0 Existing $14,320 $1275127	$0 Existing $14,320	
36	MO	MOJ	36-AA-0057		Landers DS	Local Govt.	42		1_	2013_1.	201	936,892	4,132			'998	2010	Controls	Coll. + Cntl.	Open	2013	2013	6'	SO.6	$78,850	2012	2027	$201.400	$4148					
33	SC	SC	33-AA-0001		orRi	Local Govt.	120	11	1958	1985	2,400,000	400,000	2,400,000	1995	Combustion	1963	2010	Controls	No		2010	2010	6.3		sol	2011	2026	Ex	,926					
40	Isecl	slal	40-AA-0001		Paso Robles LF	Local Govt.	66	'3	1970	2031	974,622	1,597,969	2,416,260	1997	Combustion	1978	2010	Controls	No	n	2031	2031	6.7		sol	2012	2027	Ex	56,518					
33	ts	Se	33-AA-0012		Coachella Valley DS	Local Govt.	75		1972	1997	1,484,459	2.500.000	,000	2010	Combustion	1981	2010		No	Closed	2010	2010	9.1		sol	2011	2026	Ex	$1.829					
58	SV	FR	58-AA-0005			Private	33	2'	1967	1997	909,422	2,500,000	2,500,000	19991	Combustion	1984	.2010	Controls	INa		2010	2010	3.9		sol	2011	2026	Existi						
28	SF	SA	28-AA-0001		American Canyon LF	Local Govt.	97	2'	1940	2000	1,667,136	2.500,000	2.500.000	1990	Combustion	1978	2010	Controls	INa		2010	2010	11.5		sol	2011	2026	Exi	$0,					
33	SC	Se	33-AA-0009		Mead Valley DS	Local Govt.	60	'3	1974	1997	1.315,088	2,528,951	2,528,951	'998	n	1982	2010	Controls	No	Closed	2010	2010	9.4		sol	2011	2026	Ex						
43	SF	SA	43-AA-0004		Pacheco Pass LF	Private	91	'9	1963	2004	862,577	2,064,554	2.581.707	1994	Combustion	1983	2010	Controls	INa		2010	2010	10.2		sol	2011		Ex	$8,987					
36	SC	Be	36-AA-0017		California St. IF	Local Govt.	108	'3	1963	2031	.760,853	1,627,494	2,670	2001	Combustion	1983	2010	Controls	INa	'n!	2031	2031	7.6		sol	2012	2027	Exi						
54	ISJvl	SJU			Teapot Dome OS	Local Govt.	71	11	1972	2005	679,732	1,646	2.810.691	2005	Combustion	1985	2010	Controls	INa		2010	2010	8.1		sol	2013	2028		$7,012		5127 $127			$76,048
44	INeel	MBU	44-AA-0001		City af Santa Cruz IF	Local Govt.	57.5	33	1966	2037	793,897	1,869,373	844,784	1991	Combustion	1983	2010	Controls	INa	Open	2037	2033	11.1		sol	2011		Ex	$5.679		$70,715 $127	$0 Existing $22,715 $127	$0	
37	SD	SO	37-AA-0005		Ramona IF	Private	46	'5	1969	2006	791,182	1,642,804	883,	19971	Combustion	1981	2010		No		2010	2010	5.0		$0	2012	2027	Ex	$4,543					
35	INeel	MBU	35-AA-0001		John Smith Road SWDS	Local Govt.	44	13	1968	2024	712,443	1,667,101	2,905,134	1998	Combustion	1981	2010	Controls	No	0	2024	2024	8.2	0	sol	2011	2026	Existi	$4,345		$127 $85,392 $127	$0 Existing $17,362 $127		
MOJ					arstow RDS																												

!.Analys's Year

						Ownership Status	Max. Waste Footprint (acres) d	Average Rainfall (Inch/Yr)	Open Year b	Close Year	1990 WIP (Tons)	_WI> (Tons)	2020WIP (Tons)	Year LFG Capture	Updated Control Type (2009) e	Year >= 450,000 Tons WIP	Effective Year of Control (WIP Criteria)	Gas Heat Rate Calc. Test?	New Hardware?	2010 Status	Ga Heat Cap. Calc	Final Gas Heat Calc. Year	Max. Gas Rate (MM BTU/HR)	Capital Cost of Control (lump sum)	Annualized Capital Cost	Assumed Start Year for Cap Cost Amort.	Assumed EndYear for Cap. Cost Amort.	Annual Operation & Mtce Cost	Surface Monitoring & Improved Cover Maintenance (Cost/Test)	Annual Monitoring Frequency	2010	2011	2012	2013
																												$222,400	$4,642		127		$68,567	$222,400 $18,567
				1	SouthChoRa.	Local Govt.	120	11	1952	1981	3.000.000	3,000,000	3.000.000	1990	Combustion	1957	"2010	Controls	No		2010	2010	7.1		sol	2013	2028	Ex	511,851		$127		405	$0 Ex $47,405
33	SC	SC	33-AA-0008	1	Double Butte DS	Local Govt.	100					3.000.000	3.000.000	1994	Combustion	1975	2010	Controls	No	Clo	2010	2010	9,'		$0	2011	2026	Ex	$2,438		$57,752 ;127	$0 Existing ",7S2	$0 Existing ",7S2	$0
33	SC	SC	33-AA-0003	1	Highgrove LF	Local Govt.	71	13			1,264,218	3,002,920	3.002.920	1997	Combustion	1984	2010	Controls	NO		2010	2010	11.3		$0	2012	2027	Ex	S.1.731		127	,924	$0 Exi $6,924	$0 Existing $6,924
						Local Govt.	146	47	1961	1984	3,500,000	3,500,000	3.500.000	1991	Combustion	1963	2010	Controls	No		2010	2010	9.2		$0	2013	2028	Exist	514,419		127		5105.676	S0 Exi $57,676
					Arvin SLF	Local Govt.	143	1- 1	1971	2008	1,669,202	3,519,658	3,520,296	2001	Open Flare	1978	2010	Controls	Encl. Flare		2010	2010	4,.	$284,590	$27,406	2018	2033	$625,600	$14,123		$127			
54	SJV	SJU	54-AA-0008		Woodville OS	Local Govt.	153	It	1970	2026	1,258,544	644,186	3.755.863	2004	Combustion	1978	2010	Controls	No	nI	2026	2026	10.7		$0	2012	2027	Ex	515,110		127	5108441 $127	$0 Existing $60,441 127	Ex $60,441 5127
10	SJV	SJU	10-AA-0002	1	Chaleau Fresno LF				1950	1996	2,132,332	3.800.000	3.800.000	19931	Combustion	1979	2010	Controls	No	Closed	2010	2010	21.0		$0	2013	2028	Exi	$7,407		$127		$77,628	$0 Exi $29,628
33	SC	SC	33-AA-0004	1	Corona Disposal Site	Local Govt.	95	J1	1961	1986	4,000,000	4,000,000	4.000.000	1990	Combustion	1963	2010	Controls	No	Closed	2010	2010	10.8			2013	2028	Existin	"		.5127			
56	SCC	VEN	56-AA-0004	L	[illegible]	Local Govt.	120	15	1962	1989	4,000,000	4,000,000	4,000,000	1991	Combustion	1965	2010	Controls	No	Closed	2010	2010	11.5		$0	2011	2026	Exi	$11.851		$95,405 127		S0 Existi $47,405	S0 Ex 547405
							130	19	1960	1994	3,410,394	4,000,000	4,000,000	'99'	Combustion	1967	2010	Controls	No		2010	2010	,2.,		$0	2012	2027	Existi.	512.839		5t27	$99,355	$0 Existi S51355	$0 Ex $51
						Local Govt.	120	15	1989	1996	1,879,583	4,000,000	4,000,000	'99'	Combustion	1988	2010	Controls	No		2010	2010	16.0		sol	2013	2028	Ex	511.851		$127		"',405	Exis $47,405
					Avenal LF								4,003,699			1997	2010	Controls	Coll. + Cntl.	Open	2020	2020	11.6	$2,353,480	$226,840	2011	2026	$542,440	512.187		,669 127			
45	SV				West Central (Phase 2	Local Govt.	100	37	1990	2013	106,919	2,101,253	4,581,004			1993	2010	Controls	Coll. + Cntl.	Open	2013	2013	20.9	$1,915,000	$184,4151	2012	2027	5445.000	$9,876		$127	$87,504 ,'27		
45	SV	SHA	45-AA-0020	1	Anderson LF	Private	165	29	1976	2049	550,274	2,063,459	4,647,695	12006	Combustion	1988	2010	Controls	No	Open	2049	2033	20.9		$0	2012	2027	Exi	5IB		127	$113		
10	SJV	SJU	10-AA-0005	1	City of Fresno LF	Local Govt.	145	11	1937	1987	4,700,000	4,700,000	4,700,000	2000	Combustion	1945	2010	Controls	No		2010	2010	11.5		sol	2011	2026	Existi	514,320		$105,281 127			Exi $57,281
13	SS	IMP	13-AA-0019	J	Republic-Imperial	Private	73				279,924	1,656,219	4.708.951			1993	2010	Controls	Coll. + Cntl.	Closed	2010	2010	13.8	$1,404,700	$135,2731	2012	2027	.$331,600			'27	576.838		$135,273 331,600 $28,838
20	SJV	SJU	20-AA-0002		Fairmead LF	Local Govt.	77	11	1958			,543	4,781,653	1998	Combustion	1986	2010	Controls	No	nI	2033	2033	13.8		$0	2012	2027	Exi	,605		$127	$78,418 5'27	$0 $30 418 127	$0 Existi $30 418 127
54				1	Visalia DS	Local Govt.	247	11				'|'|	4,782	2004	Combustion	'98'	2010	Controls	No	0'	2024	2024	14.3		$0J	2012	2027	Exi	$24,394		127	$145575 127	S0 Ex 597575 $127	S0 Ex $97 $127
SF				1.	Davis Street	Local Govt.	194	21	1965	1980	"'000	I4.000	4,800,000	1990	Combustion	1965	!2010	Controls	No	Closed	2010	2010	,2.,		sol	2012	2027	Exist	$19,159		127	$124,638	S0 Ex $76,638	S0! Existing $76,638
39					North County LF	Local Govt.	185	17	1990	2033	94,996	2,161,867	5.090.525		Combustion	1993	2010	Controls	No	'n f	2033	2033	15.3		$0	2012	2027		18,271		127			$0 Exi $73,082 $127
50	SJV	SJU	50-AA-0001	1	Fink Rd LF	Local Govt.	216	11	1973	2019	706,220	2,793,994	5,158,987	20041	Combustion	1986	2010	Controls	No	'n I	2019	2019	15.1		$0	2011	2026	Ex	521,332		$133,329 127			
42	SCC	SB	42-AA-0016	1	City of Santa Maria LF	Local Govt.	245	15	1940	2017	1,217,394	3,247,271	,263	119981	Combustion	1981	2010	Controls	No	Open	2017	2017	15.5		$0	2011	2026	Exi	$24,196		$144,785 127			
44	NCC	MBU	44-AA-0004	1	Buena Vista DS	Local Govt.	61	23	1956	2021	1,321,475	3,250,261	'4'''''	1991	Combustion	1977	2010	Controls	No	Open	2021	2021	21.8		$0	2011	2026	Exi	,024		2,097 5127			
16	SJV	SJU	16-AA-0021	1	Kettleman Hills SLF	Priv	43	,	1...	2023		1 685025	5,488 215	20051	Combustion	2000	2010	Controls	No	Open	2023	2023	16.2		S0	2011	2026	Exi	$4,247		$64,987 $127	127		$0 $16,987 $127
15	SJV	SJU	15-AA-0057	1	Shafter-Wasco SLF	Local Gov!.	135	L ,l	1972	2027	1,141,979	3,043,121	5,665.322	2002	Combustion	1983	2010	Controls	No	nI	2027	2027	6.5		$0	2012	2027		$13,333		5127	$101330 127	$0 127	$0 Exi $53,330 $127
37	SD	SD	37-AA-0008	1	San Marcos LF	Local Govt.	107	13	1979	1997	2,483,558	6,000,000	6,000,000	19901	Combustion	1984	2010	Controls	No		2010	2010	23.4		.soJ	2012	2027	Existing	$10,567				$0 Ex	$0 Ex

207

208

CO	AS	DIS	CIWMII SWIS File Number	Count	Facility/Site Name	Ownership Status	Max. Waste Footprint (acres)	Average Rainfall (Inch/Yr)	Open Year	Close Year	[redacted] (Tons)	2006 [redacted] (Tons)	2020 WIP (Tons)	Year LFG Capture	Updated Control Type (2009)	Year >= 450,000 Tons WIP	Effective Year of Control (WIP Criteria)	Heat Rate Calc. Test?	New Hardware?	2010 Status	Gas Heat Cap. Calc	Final Gas Heat Calc.	Max. Gas Rate (MM BTU/HR)	Capital Cost of Control (lump sum)	Annualized Capital Cost	Assumed Start Year for Cap Cost Amort.	Assumed End Year for Cap. Cost Amort.	Annual Operation & Mtce Cost	Surface Monitoring & Improved Cover Maintenance (Cost/Test)	Annual Monitoring F",	Analysis Year 2010	2011	2012	2013
1	SV	IBUTt	04-AA-0002	,	Neal RD LF	Local Govt.		29	'970	2033	493,221	3.100.082	6,086,556	2002	Combustion	,'''	2010	Controls	No	Open	2033	2033	27.0	0	$0	201	2025	Ex	$13,826	4	$127			
68	Sv	FR	58-AA-0011	1	Ostrom Road SIF	Private	225	21	1995	2066		1,663,697	6,125,580	2003	Open Flare	2001	2010	Controls	Encl. Flare		2066	2033	30,1	$370,4191	535,6711	2018·	2033	$970,000	122221.	4				
40	SCC	SLO	40-AA-0004	1	Cold Canyon	Private	ıı	19	1965	2012	1,321,918	3,827,673	6,599,415	119941	Combustion	1981	2010	Controls	No	Open	2012	2012	19.3	0	$0	2012	2027	Ex	$8,691	4	$127			
36	se	se	36-AA-0067	1	San Timoteo SWDS	Local Govt.	11.	.5	1978	2016	m ,034		6,632,341	2000	Combustion	1987	2010	Controls	No	Open	2016	2016	20,1		sol	2012	2027	Ex	$2,779	4	'2'			
19	se	Isc	19-AA-0013	1	Azusa LF	Private	77	17	1958	1991	4,960,097	5,331,470	7.167	1990	Combustion	1960	2010	Controls	No		2010	2010	17A	0	sol	2013	2028	Exi	Sl.en	4	$127			
45	SV	VS	45-AA-0002		B& J Drop Box	Private	260	21	1964	2070	1,529,609	3.911.141	7.168.617		Combustion	1973	2010	Controls	No	Open	2070	2033	28.2	0	$0	2012	202'	Ex	$25,678	4	$127	$150,710 $127	$0	$0 Existi
7	SF	t BA	07-AA-0002		Acme LF	Private	.09	17	1954	2003	6,429,329	,842	7,488,750	1991	Combustion	1955	2010	Controls	No		20101	2010	19.4	0	$0	2012	2027	Exi	$10.765		$127	$91,059		
19	se	t SC	19-AH-0001		Whittier- Sa	Local Govt.	132	'5	1963	2039	3,027,749	6.176.012	7.618,193	1993	Combustion	1966	2010	Controls	No	Open	2039	2033	20.5		$0	2012	2027	Existing	13.218	4	127	$60,873 127	$0 Existing $12,873	
34	SV	SAC	34-AA-0020		L&DLF	Private	'57	'9	1977	2013	1	3,565,900	7.739.980	2004	Val	1981	2010	Controls	Coll. + Cntl.	Open	20131	20131	22.6	$2,992,300	$288,158	2011	2025	$684,400	$15,505		$110021 $127	$288158 $684 400 021 127		
24	SJV	SJU	24-AA-0001		59 DS	Local Govt.	255	13	1972	2043	1,322,411	3.973.714	7,847,858		Carbon	1980	2010	Controls	Encl. Flare	ODlln!	2043	2033	23-,0	$347 872	$33,500	2012	2027	$1.096.000	$25,184					
43	SF	SA	43-AN-0015		Guadalupe SLF	Private	115	25	1929	2020	1,034,929	,469,114	7,922,634	1990	Combustion	1964	2010	Controls	No			2020	10.6	0	$0	2011	2026	Ex	$11.357	4	$93,430			
27	NCC	MBU	27-AA-0007		Horse LF	Local Govt.	72	'5	1960	2009	1.189.474	4,000.135	7,943,988	119931	Combustion	1981	2010	Controls	No		2010	2010 1	23.2		$0	2011	2025							
19	se	se	19-AR-0006		Penrose Pit	Private	72	17	1960	1985	9,000,000	9,000.000	9.000.000	1990	Combustion	1960	2010	Controls	No				23.•	0	$0	2012	2027	Ex	$1,755	4	$127	$55,021	S0 Existing $7,021	$0 Existing $7.021
31	SV	PLA	31-AA-0210		Western Regional LF	Local Govt.	23.	2'	1960	2036	1,201,867	4,538,046	9,086,821	1993	Combustion	1984	2010	Controls	No	nl	2036	2033	39.9		sol	2011	2025	Ex	$22,814	4	$139,254 $127	$91,254 $127	$0 $91,254 $127	$0 $91,254 $127
39	SJV	SJU	39-AA-0004		Foothill LF	Local Govt.	50	17	1965	2054	551,014	4,123,926	9,156,468		Flare	1989	2010	Controls	Encl. Flare	O	2054	2033	27.2	$347,872	$33,500	2018	2033	0235.000	$4,938	4				
57	SV	YS	57-AA-0001		Yolo Co. Central LF	Local Govt.	.73	19	1975	2045	2.m.248	5,833,578	9,244,718	1992	Combustion	1977	2010·	Controls	No	nI	2045	2033	26.4		sol	2011	2025	Ex						
19	MD	AV	19-AA-0009		Antelope Valle	Private	57		1952	2006	269,364	3,743,346	9,607,924	2004	Combustion	1992	2010	Controls	No		2010	2010	39.3		$0	2013	2028	Ex	$5,629	4	$127			
42	SCCISB		42-AA-0015		Taliquas LF	Local Govt.	118	17	1967	2020	2,654.471	•••	10,283,897	1996	Combustion	1974				n	2020	L2020	29,6		sol	2011	2025	Ex	$11,854	4	$94,615 $127	$0 Exist, $48,615 $127 $0	$0	$0
36	MD	MOJ	36-AA-0045		Victorville RDS	Local Govt.	341		1955	2059	1,067,804	4,348,479	10,626,492	2003	Combustion						2059	2033	30.7		sol	2011	2025	Exi	$33,677	4	$182 709 - 127	Existing $134,709 S127		
43	SF	BA	43-AN-0006		C&nvonLF	Private	311	23	1986	2025	1,775,249	6,608	11,149	9'' 9	Combustion	1986	2010	Controls	No	Open	2025	2025	26.3	0	$0	2012	2027	Ex	$30,714	4	$127			
27	NCC	MBU	27-AA-0010		Monterey Peninsula LF	Local Govt.	315	'5	1966	2064	3,981,093	7.517,740	11,570.780	119901	Combustion	1969	2010	Controls	No								2025	Ex	131,109	4	$172,438 $127	$'27	$127 $0 Existing $28,183	Existi $124,438 $127 $0 Existing $28,183
19	se	SC	19-AR-0002		„	Private	289	'9	1958	2008	802.887	2,865,249	11,819,433	1992	Combustion	1989	2010	Controls	No	Closed	2010	2010				2012	2027	Ex		4	$127	$78,183		
36	se	SC	36-AA-0051		Colton LF	Local Govt.	82	13	1964	2006	1.587.378	6,062,952	11,840,653	2001	Combustion	1982	2010	Controls	No		2010	2010	34.4		sol	2012	2027	Exi	$1,999					
56	SCCt	VEN	56-AA-0005		Toland Rd. LF	Local Govt.	92	19	1970	2027	675,668	098	11,982,793	19971	Combustion	1983	110	Controls	No	nl	2027	2027	34.4		$0	2011	2025	Exi	$9,088					
36	SC	SC	36-AA-0054		Milliken	Local Govt.	140	'5	1956	2001	6,339,070	12.011,629	12,011,629	1990	Combustion	1960	2010	Controls	No		2010	2010	39.8	0	$0	2011	2025		4131					
19	MO	AV	19-AA-0050		Lancaster Waste	Private	209		1954	2012	1,253,944	4,821,267	12,577,703	1993	Combustion	'9"	2010	Controls	No	,nl	2012	2012	10.6	0	$0	2011.	2026	Ex	$20,641					
					:dom Hill																													

--1-

Analysis Year

CO	AB	DI.	CIWMB SWIS File Number	Count	Facility/S ame	Ownership Status	Footprint (acres)	Rainfall (inch/Yr)	Open Year	Close Year	1990 WIP (Tons)	2008 WIP (Tons)								G. Heat Cap. Calc	Final Gas Heat Calc. V...	Max. Gas Rate	Capital Cost of Control (lump sum)	Annualized Capital Cost	Assumed Start Year for Cap Cost Amort.	Assumed End Year for Cap. Cost Amort.	Annual Operation & Mtce	Surface Monitoring & Improved Cover Maintenance (Cost/Test)	Annual Monitoring Frequency	2010	2011	2012	2013
																												$3.608		433 ;127	Exisi $14,433	Exisi $14,433	$14,4331
30					Santiago Canyon SLF	Private	130	15	1968	1SS6	8,938,769	13,284,221	13,284,221	1991	Combustion	1972	2010	Controls No		20'0	20'0	33.'		$0	2013	2028	Existi	$3,189				$60,678	Existing $12,678
				1	Bakersfield SLF (Bena)	Local Govt.	229	9	'SS2	2038		4,757,447	13,408,350	20001	Combustion	1992	2010	Controls INo	Open	2038	2033	312		$0	2012	2027	Ex	'|'		'27 127	. 5138 484 $127	Ex $90 484 127	Ex $90 464 1
					Lamb eanyon os	Local Govt.	144.6	17	1970	2023	1,350,362	5092563	14,048,887	2002	Combustion	,SO,	2010	Controls No		2023	2023	40.•		soJ	2011	2026	Ex	$3,		$82,101 $127	Ex $14,101 127	Ex $14101 1	Ex 514101 127
49	SF.BA		49-AA-0001	.!	Central LF	Local Govt.	172	29	1972	2019	4,585,243	11 192,029	14,126,201	1990	Combustion	1974	2010	Controls No	Open	2019	2019	••••		soJ	2011	2026	Existi	$16,987		115,947 $127	Existi $57,947 $127	Existi $67,947 $127	Ex 947 127
	SF	BA	01-AA-0008	1	Tri-Cities LF	Private	115	'5	1968	2005	4,217,879	9,325,621	14,655,691	1990	Combustion	1971	2010	Controls No	Closed	20ID	20.0	495		$0	2013	2028		;11.357		$127		$93,430	$45,430
21	SF	BA	21-AA-0001	1	Redwood SLF	Private	195	29	1958	2039	1,960,908	8,286,636	15,476,521	1990	Combustion	1981	2010	Controls No		203S	2033	62.3		sol	2011	2026	Ex	St.				Existi $77,033 127	$0 Existing $77,033 ;1271
7	SF	BA	07-AA-0001		W Contra Costa LF	Private	160	23	1953	2006	4,483,715	9,410,067	15,665,749	1992	Combustion	1960	2010	Controls No		2010	2010	••••			20'2	2027	Ex	$15,802		_$127	111,206	$0 Ex $63,	Existi $63,
19	SC	se	19-AA-0819	1	Toyon	Local Govt.	90	17	1957	1986	16,000,000	16,000,000	16,000,000	1990	Combustion	,957	2010	Controls INo		2010	2010	42.3		$0	2012	2027	Existi	$2,194		$127	$56,777	$0 Ex sam	Exi m
10	SJVI	SJU	10-AA-0009	1	American Ave.	Local Govt.	361		1971	20311	2,260,006	6,990,887	18,983,923	2000	Combustion	1974	2010	Controls No	Open	2031	203'	49.2		SOJ	2011	2026	Existi	535.892		-$1	Ex 609 $127	Ex $1 609 $127	Ex 142 127
19	SC	se	19-AA-0015	1	Spadra LF	State Govt.	173	17	1957	200CI	10,144,050	17,538,815	17536915	1990	Combustion	1961	2010	Controls No	Closed	2010	20'0	100.1		sol	2013	2028	Ex	$4,218				$64 871	Ex $16871
19	SC	se	19-AA-0820		Lopez Canyon LF	Local Govt	186	19	1975	1996	14,616,276	19,000,000						Controls No	Closed	2010	20'0	65.•		$Oj	2012	2027	Ex	$4,047	41'	127	$64,188	Ex $16,188	Ex $16,188
33	SC	SC	33-AA-0006		Badlands os	Local Govt.	150	15	1968	2018	674,139	6,768,636						Controls INa	nl	2018	201.	570		$0	2011	2026	Ex	$3.657					
	SF	BA	01-AA-0010		Vasco Road IF	Private	222	15	1962	2016	3,990,878	11.845,745	21,368,916	1996	Combustion	'973	20.0	Controls No	,nl	2016	20'.	".4		sol	2012	2027	Exi	$21,925		,27	$135,699		
19	se	se	19-AA-0836	1		Private	190	17	1948	1984	22,000,000	22,000,000	22,000,000	1995	Combustion	1948	2010	Controls No		2010	2010	53.4			2011	2026	Existi	$4,632		$66,529 $127			
7	SF	BA	07-AA-0032	1	Keller Canyon LF	Private	244	17	1992	1 2037		7,678,238	690.827	1993	Combustion	1994	2010	Controls INo	0.	2037	2033	SS.5		sol	2011	2026	Ex	.$24.097		$144,390 St27	$0 Existing $96,390 $127 $0		Exi $96,390 St27
19	SC	se	19-AE-0001		Palos Verdes	Local Govt.	291	13					23,600,000	1990	Combustion	1956	2010	Controls INo.		2010	2010	57.•		sol	2011	2026	Ex	$7,095		$76,378 St27	Existi $28 378	Ex S28 378	Ex $28 378
48	SF	BA	48-AA-0075		Potrero Hills	Private	190	21					24,710,972	1993	Combustion	1989	2010	Controls No		2DSS	2033	112		$0	2011	2026	Ex	$18,764		$123,058 $127	Ex $75 058 5127	$75 058 $127	Ex 75 058 1
36	SC	SC	36-AA-0055	1	Fontana RDS (Mid-Valley)	Local Govt.	408	21	1958	2033	2,468,265	9,786,714	25,197,761	1995	Combustion	'974	2010	Controls INo		2033	2033	111.2		$01	2011	2026	Ex	".047		$87,788 St27	Existi $39 788 $127	Ex $39 788 $127	$39 788 $127
191sclse				3	[illegible]	Local Govt.	375	'9								'057	2010	Controls No	c.'	2010	2010	5.7		sol	2011	2026	Ex	.$9,143			Ex $36 570	Ex $36 570	Ex $36 570
						Private	325	13								'082	2010	Controls No		2010	2010	1OS.6		sol	2013	2028	Ex	$7,					Exi $31,694
56	Isee	IVEN	56-AA-0007		S,lml Valley LF	Private	185.61	15	1970	2022	4,946,498	13,739,623	27,823,257	1991	Combustion	1971	2010	Controls No	n 1	2022	2022	SS.5			2011	2026	Ex	$18,331		$121 $127			
43	SF	SA	43-AN-0003	1	Newby Island	Private	313.2	15	1932	2016	2,409,383	15,745,481	26	1 1992	Combustion	1985	2010	Controls INo	ln	2016	2016	58.'		.sol	2011	2026	Ex	,032		$171,727 St27			
41	SF	BA	41-AA [illegible]	1	[illegible]	Private	191	33	197.	2023	3,102,821	18,593,446	26.255.388	'SS1	Combustion	'083	2010	Controls INo	Open	2023	2023	171.5		$0	2011	2026	Ex	$18,863		$123,453 St27			
34	SV	SAe	34-AA-0001		Kiefer LF	Local Govt.	667	19	1967	2035	4,882,713	17,499,572	30,055,405	1994	Combustion	1976	2010	Controls No	Open	2035	2033	88.7		sol	2011	2026	Exi	673		$311492 St27			
37	so	SO!	37-AA-0023		Sycamore SW LF	Private	324	13	1976	2016	2,934,513	14,111,841	31,614,977	1999	Combustion	1979	2010	Controls INo	Open	2016	2016	143.2		.soJ	2011	2026	Ex	$3,		$175,993 St27			
19	se	se	19-AA-0056		Calabasas LF	Local Govt.	416	19	1961	2028	13,172,817	22,479,153	31,874,338	1990	Combustion	1961	2010	Controls No	Open	2028	2028	144.1		sol	2011	2026	Existi			$88 566	Exi		

col	ASI	DISI	CIWMB SWISFIle Number	Count [a]	Facility/Site Name	Ownership Status	Max. Footprint (acres) [d]	Average Rainfall (inch/Yr)	Open year [b]	Close year	1990 WIP (Tons)	2006 WIP (Tons)	2020 WIP (Tons)	Year LFG Capture	Updated Control Type (2009) [a]	Year >= 450,000 Tons WIP	Effective Year of Control (WIP Criteria)	Gas Heat Rate Calc. To	New Hardware?	2010 Status	Gas Heat Cap. Calc	Gas Heat Calc. Year	Max. Gas Rate (MM BTU/H)	Capital Cost of Control	Annualized Capital Cost [a]	Assumed Start Year for Cap Cost Amort.	Assumed End Year for Cap Amort	Annual	
19	SC	SC	19-AA-0012		Scholl Canyon LF	Local Govt.	440	1'	'96'	2014	19,443,400	27.791.673	38.374.233	'990	Combustion	'960	2010	Controls	No		2014	2014	149.8	0	$0	2012	2027		4
30	SC	SC	30-AB-0019		Prima Descha SLF	Local Govt.	•••	'3	1976	2067	12,035,9171	21.893.121	36,376,606	1991	Combustion	975	2010	Controls	No		2067	2033			sol	2012	2027	E,,,	$17,042 4
19	SC	SC	19-AA-0653		Sunshine Canyon Extension	Private	215	21	1996	2008		12,656,411	36,856,156	1992	Combustion	,'''	2010	Controls	No	Clo	2010	2010	281.2	-T-	$0	2012	2027	Existing	$5,242
39	SNI	SJU	39-AA-0015			Priv•••	354.5	'5	1973	1-2020	1,973,144	15 ,704	37,950,388	1991	Combustion	1976	2010	Controls	No	In'	2020	2020	3.9		sol	2011	2026	Ex'	$35010
19	se	SC	19-AR-0006		Bradley Ave East & West	Private	171	17	'969		12,963,834	33.518,023	38,729.613	1990	Combustion	'960	2010	Controls	No	Clo	20••	2010	144.1	0	$0	2012	2027	Exi	$4,169
19	sc	se	19-AF-0001			Private	370	17	1962	1996	29,126,627	45,800,000	45,800,000	1990	Combustion	1963	20••	Controls	No	Clo	2010	2010	162.7	0	$0	2011	2026	Exi	$9,021
37	SO	SO	37-AA-0010		Otay SWLF	Private	230	11	1963	2021	7.065.578	21,650,	5II ,469	1991	Combustion	.965	2010	Controls	No		2021	2021	237.8		SO	2011	2026	Ex	$22,715
19	sc	SC	19-AA-0052			rivate	257	'5	1972	2019	4,310,480	22,074,046	50,973,493	1995	Combustion	'.75	2010	Controls	No		2019	2019	147.4	0	$0	2011	2026	Existing	$6,266
37	SO	SD	37-AA-0020		Miramar SWLF	Milita	470	11	1959	2011	6,156,512	27,951,838	52,513,559	119951	Combustion	I."	2010	Controls	Na		2011	2011	156.6	0	$0	2011	2026	Ex.	
33	sc	se	33-AA-0217		El Sobrante SWLF	Priva"	495	'3	1983		1,619,035	19,711,183	59,173,030	19941	Combustion	'964	2010		N.		2030	2030	173.9	0	$0	20 2012	2027	Ex'	
	SF	SA	01-AA-0009		Altamont LF	Priv•••	443	'5	1980	2028	14,967,744	39 ,442	63,607,251	'990	Combustion	1979	2010		N.		2028	2028	141.3			2012....	2027	Ex'	$43,751
30	sci	SC	30-AB-0360		Frank R. Bowerman	Local Govt.	341	'5	'999		6,541.179	36,445,683	75 .049	11	Combustion	'969	2010	Controls	No		2022	2022	195.2	●	$0	2012	2027	Exl	$8,314
30	sc	SCi	30-AB-0035		Olinda Alpha SLF	Local Govl.	420	.5	1960	2013	14,557,799	45.305,372	86,102,427	1990	Combustion	'96'	2010	Controls	No	n	2013	2013	319.9	0	$0	2012	2027	Existi	$10,240
19	sc	SC	19-AA-0053		Puente Hills LF	Local Govt.	640	'7	1957	2013	55,110,679	116,141,687	185,036,763	'999	Combustion	'956	2010	Controls	No	n	2013	2013	970.5	0	sol	2012	2027	Ex.	$15,603

$6,266	4	$73,063	$25,063	$25,063	$25,063	
		$127	$127	$127	$127	
			$0	$0	$0	
			Existing	Existing	Existing	
8,417	4	$233,669	$185,669	$185,669	$185,669	
		$127	$127			
				$0	$0	
$8,314	4		$81,254			
		$127	$127			
$10,240	4		$88,958			$0 Existing $40,958
		$127	$127			$127 $0 Existi
$15,603			$110,413			
	7		$127			
			$11,348,948			

23,247
Tot. # Acres

68 | Closed

$7,177,980 Private LFs: Costs Ann. Tal

Govt. LFs:

Subtotals: $1,697,219 $5,187,880 $6 652

Affected CA MSW Landfills (by SWIS #): '49 146 By Facil 551,129 1,153,801 5,570 146 $16,911,752

Totals: $6,36•.451 S1••814 $6,387,065 $9,689 9 34 $14,045,189 $13,299,285

4 n flares and 1 carbon a in unit

Private:	49
Local Govt:	11
State Govt:	1
Fed. Govt:	●
Tribal Govt.:	0
Military:	2
All Govt:	11
Total:	146

Landfills w/o Controls:
ate & covt.)
Capital Costs $1,663,718
O&M Costs
Monitoring Costs
Reporting Costs S1147
Total: $5,846,806 $6,

Landfills w/ Controls:
ate &
Ca l Costs
O&M Co. .
Monitoring Costs
Ro rti
Total:

$6,387,065 | $11,348,948 | $14,045,189 | $13,299,285

• Some facilities are co of more that one SWIS # and were evaluated ••• facility for emission inventory and cost
O Year in Bold indicates ARB Estimate
• Recov Factor of 0.0963 for n = 15 years, I = 5%
E In Bold denotes information.
• Entries in bold denote 2009

1-

Capital Costs

Annual Operation &

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2021	2028	2029	2030	2031	2032	2033	Subtotal	Private	Local GOvt.	S__ Govt.!	Fed Govt.!	Trlbal Govt.	Milito,	Subtotal	Private
$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210									$1,128,155		51.128.155						
$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193000	$193 000	$193000	5193 000								$4,439,000	
$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15	$15	$15	$15,802									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing			Existi	Ex	Existi	Ex									$0
$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233	$29,233			$29	$29,233	$29,	$29,233									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0						-	$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing			Ex	Existi	Exi										
$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641			$12,641	$12,641	S 2,641	$1 641									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing			Ex	Ex	Exi	Existing									
$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197	$16,197			$16,197	$16,197	S16,197	516,197									$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing			Ex	Ex	Ex	Existing									
$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221	$14,221			S14221	$14 1	$14.221	$14,221									
$93,411	$93,411	$93,411	$93,411	$93,411	$93,411	$93,411	$93,411	$93,411	$93,411	$93,411	$93,411	$93,411								$1,401,165		$1,401,165						
$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$235,000	$236	$235	0 $235,000								_SS.170	
$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	519752	$19752	$19,752									
$127	$127	$127	$127	$127	$127	$127	$127																					
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0		$0					----SO.	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existi	Existi g	Existing									
$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30,813	$30813	$30,813									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0.	$01
$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exist								$0	$01
$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18,606	$18.606									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing														$0	
$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468	$26,468															
$106,151	$106,151	$106,151	$106,151	$106,151	$106,151	$106,151	$106,151	$106,151	$106,151	$106,151	$106,151	$106,151								$1,592		$1						
$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400	$264,400								$6,081,200	
$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517	$22,517									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127									
$163,848	$163,848	$163,848	$163,848	$163,848	$163,848	$163,848	$163,848	$163,848	$163,848	$163,848	$163,848	$163,848								$2,457,716						$2,457,716		
$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540	$397,540								$8,745.880	
$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040	$35,040									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0	
$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012	$15,012									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0	
$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612	$8,612									
$127	$127																											
$82,491	$82,491	$82,491	$82,491	$82,491	$82,491	$82,491	$82,491	$82,491	$82,491	$82,491	$82,491	$82,491								$1,237,359	$1.237,359							
$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800	$209,800								$4,615,600	$4,615,600
$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382									
$127	$127	$127	$127	$127	$127	$127																						
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578	$33,578									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246	$12,246									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127																			
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208	$31,208									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Exist	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291	$4,291									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775	$49,775									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752	$19,752									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127													
$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110	$66,110															
$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000	$172,000								$3,784.000	
$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826	$13,826									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127														
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								soL_	$0
$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456	$11,456									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0														$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046	$6,046									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0	
$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430	$45,430									

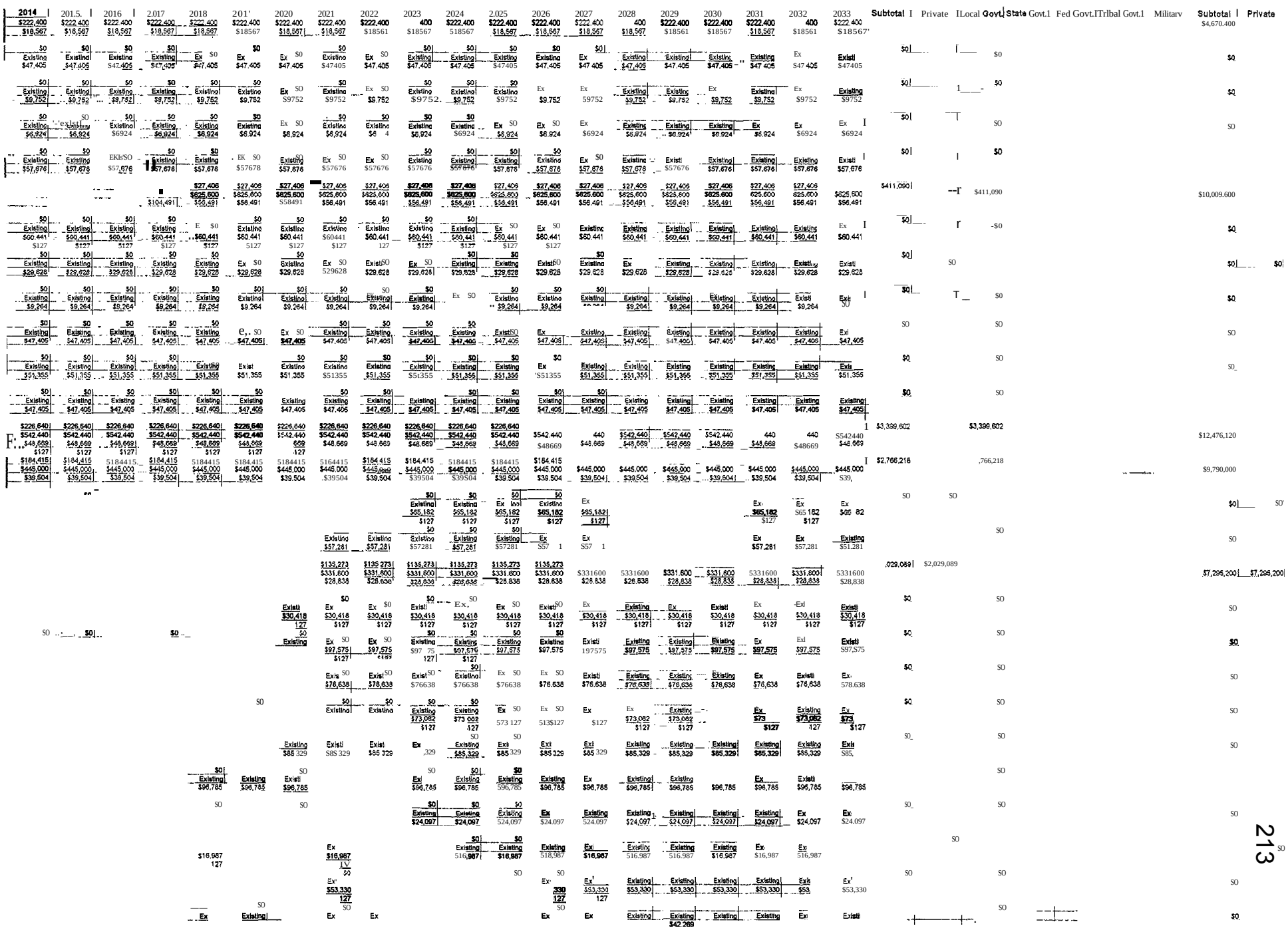
i-

212

Capital Costs

Annual Operation &

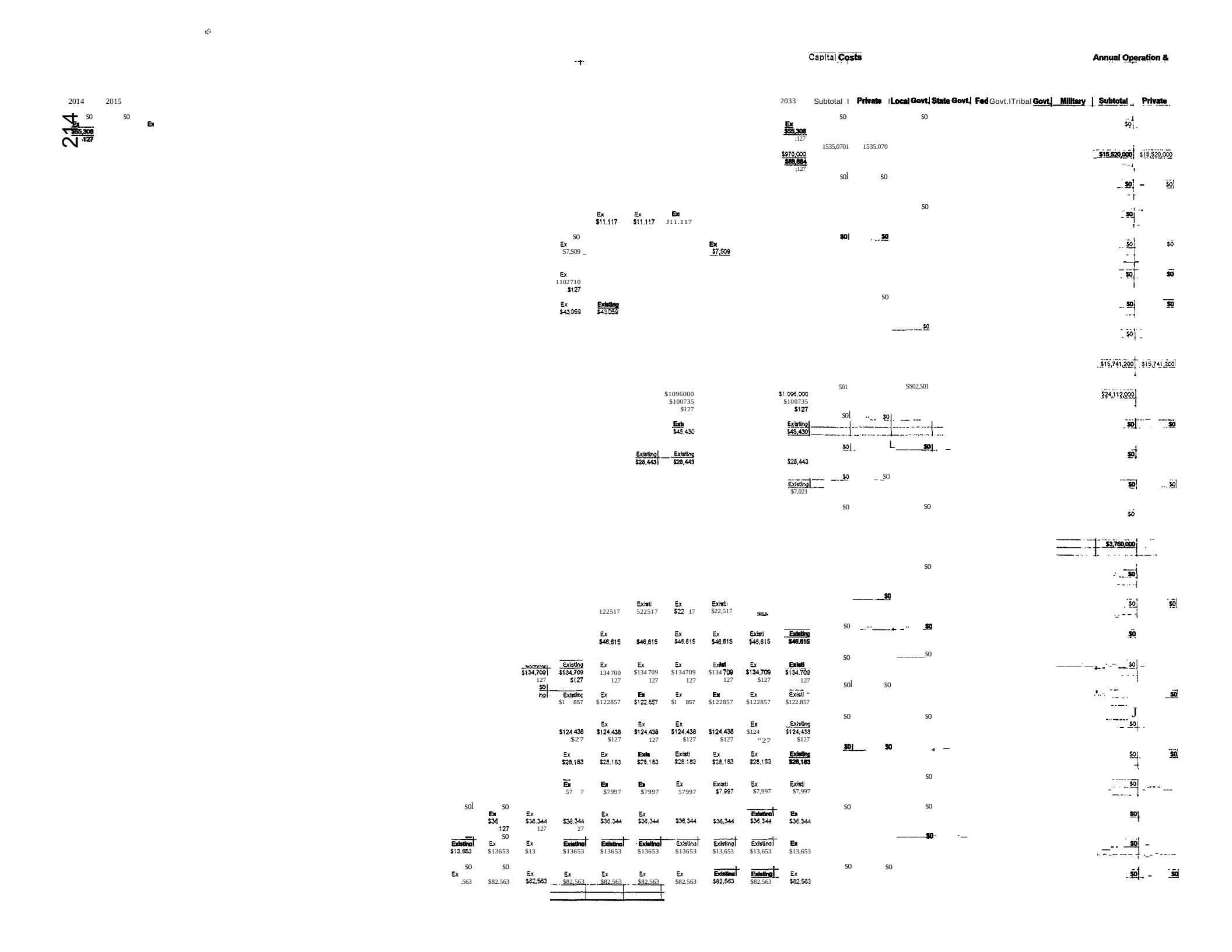
2014	2015	201&	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Subtotal I	Private	Local Govt.	State Govtl	Fed Govt.	Tribal Govt.	Military	Subtotal	Private
			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0										$0						
				Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing		Ex...	Existing	Existing	Existing	Existing	Existin									
				$22,912	$22,912	$22,912	$22,912	$22,912	$22,912	$22,912	$22,912	$22,912		$22,912	$22,912	$22,912	$22,912	$22,912	$22,912									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing			Ex									
$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876	$9,876		$9,876									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Ex	Existing	Existing	Existing	Exis	Exi									
$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256	$59,256		$59,256	$59,256	$59,256	$59	$59,256									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing		Exi	Existing	Existing	Existing	Existing	Existi									
$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								50	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing		Exi	Existing	Existing	Existing	Existing	Exi									
$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778	$4,778									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0,	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existin		Existing	Existing	Existing	Existing	Existing									
$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13,273	$13	$13,273	$13,273	$13,273	$13,273	$13,273									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127																			
				$27,406	$27,406	$27,406	$27,406	$27,406	$27,406	$27,406	$27,406	$27,406	$27,406	27,406	$27,406	$27,406	$27,406	$27,406	$27,406	$411,09D1		$411,090						
				$159,400	$159,400	$159,400	$159,400	$159,400	$159,400	$159,400	$159,400	$159,400	$159,400	$159 400	$159,400	$159,400	$159,400	$159,400	$159,400								$2,550,400	
			$60,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641	$12,641									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exi	Existing	Existing	Existing	Existing	Existing									
$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407	$15,407									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	127	$127	$127	$127	$127	$127									
$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210	$75,210									$1,128,155		$1,128,155						
$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193,000	$193 000	$193,000	$193,000	$193,000	$193,000	$193,000								$4,439,000	
$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802	$15,802									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0	SO						sol	$0
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exis	Exi	Exi	Ex	Existing	Existing									
$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	$16,987	S16.	$16.987	16,987	$1.	$16,987	$16,987									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0															$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exi	Ex	Exi	Exi	Existing	Existing									
$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603	$31,603									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	127	$127	$127	$127	$127	$127									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing		Existing	Existing	Existing	Existing									
$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	$36,344	536.	$36,344	$36,344	$36,344	$36,344									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exi g	Existing									
$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14,320	$14 g	$14,320									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127															
$78,850	$78,850	$78,850	$78,850	$78,850	$78,850	$78,850	$78,850	$78,850	$78,850	$78,850	$78,850	$78,850								$1,182,757		51,182,757						
$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201,400	$201 400	$201,400								$4,430,800	
$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16,592	$16 g	$16,592									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exi g	Existing									
$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11,702	$11 g	$11,702									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing			Exi									
$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073	$26,073			$26,073									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	127												
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								sol	I_SO							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314	$7,314									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0								
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036	$13,036									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$36,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319	$38,319									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exi	Existing	Existing	Existing									
$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851	$5,851									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$01	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949	$35,949									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337	$10,337									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127											
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048	$28,048									
$0	$0	$0	$0	$0	$0	$0	Exi	$0	$0	$0	$0	$0								$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	$22,715	715	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exi	Existing	Existing	Existing									
$22,715	$22,715	$22,715	$22,715	$22,715	$22,715	$22,715	127	127	2,715	$22,715	$22,715	$22,715	$22,715	$22,715	2,715	2,715	$22,715	$22,715	$22,715									
$127	$127	$127	$127	$127	$127	$127	$0	$0	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0						$0	$0							
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$16,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172	$18,172									
$0	$0	$0	$0	$0	$0	$0	Exi	$0	$0	Exi	$0	$0								$0								
Existing	Existing	Existing	Existing	Existing	Existing	Existing	$17,382	$17,352	$17,352	$17,352	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing									
$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$127	$127	$127	127	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382	$17,382									
$127	$127	$127	$127	$127	$127	$127					1																	
$87,951	$87,951	$87,951	$87,951	$87,951	$87,951	$87,951						$87,951	$87,951							$1,319,262								


Capital Costs
Annual Operation &
2014
201.5.
2016
2.017
2018
201'
2020
2021
2022
2023
2024
2.025
2026
2027
2028
2029
2030
2031
2032
2033
Subtotal
Private
Local Govt.
State Govt.1
Fed Govt.
ITrlbal Govt.1
Militarv
Subtotal
Private

Capital Costs

Annual Operation &

2014	2015	2033	Subtotal	Private	Local Govt.	State Govt.	Fed Govt.ITribal Govt.	Military	Subtotal	Private
214										



																				Capital Costs						Annual Operation &	
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Subtotal	Private	Local Govt.	Fed Govt.	Tribal Govt.	Military	Subtotal	Private
Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Existing $14,433	Exi $14,433							$0	
$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	$0 Existing $12,678	Existing $12,678	Existing $12,678	Existing $12,678	Exis $12,/	Exi $12	Existing $12,678	$0	$0					$0	
$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	$0 Existing $90,464 $127	Existing $90,464 $127	Existing $90,464 $127	Existing $90,464 $127	Existing $90,464 $127	Exis $90,464 $127	Exi $90 464 127	Exi $90,464 $127	$0		$0				$0	
$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101 $127	$0 Existing $14,101	$0 Existing $14,101	Existing $14,101	Existing $14,101	Existing $14,101	Existing $14,101	Existing $14,101	Existing $14,101	Exist $14,101	Exist $14,101			$0					
$0 Existing $67,947 $127	$0 Existing $67,947 $127	$0 Existing $67,947 $127	$0 Existing $67,947 $127	$0 Existing $67,947 $127	$0 Existing $67,947 $127	$0 Existing $67,947	$0 Existing $67,947	$0 Existing $67,947	$0 Existing $67,947	$0 Existing $67,947	$0 Existing $67,947	Existing $67,947	Existing $67,947	Existing $67,947	Existing $67,947	Existing $67,947	Existi $67.9 7	Existing $67,947	Existing $67,947	$0		$0				$0	
$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	$0 Existing $45,430	Existing $45,430	Existing $45,430	Existing $45,430				$0							$0
$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	$0 Existing $77,033 $127	Existing $77,033 $127	Existing $77,033 $127	Existing $77,033 $127	Existing $77,033 $127	Existing $77,033 $127			Exi $77 033 127	$0						$0	$0
$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	$0 Existing $63,206	Existing $63,206	Existing $63,206	Existing $63,206	Existing $63,206					$0						$0
$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	$0 Existing $8,777	Existing $8,777	Existing $8,777	Existing $8,777	Existing $8,777				$0		$0				$0	
$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	$0 Existing $142,609 $127	Existing $142,609 $127	Existing $142,609 $127	Existing $142,609 $127	Existing $142,609 $127	Existing $142,609 $127										$0	
$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	$0 Existing $16,871	Existing $16,871	Existing $16,871	Existing $16,871							$0			$0	
$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	$0 Existing $16,188	Existing $16,188	Existing $16,188	Existing $16,188	Existing $16,188	Existing $16,188	Exist $16,188	Existing $16,188			$0				$0	
$0 Existing $14,628 $127	$0 Existing $14,628 $127	$0 Existing $14,628 $127	$0 Existing $14,628 $127	$0 Existing $14,628 $127	$0 Existing $14,628	$0 Existing $14,628	$0 Existing $14,628	$0 Existing $14,628	$0 Existing $14,628	$0 Existing $14,628	$0 Existing $14,628	Existing $14,628	Existing $14,628	Existing $14,628	Existing $14,628	Existing $14,628	Exi $14 628		Exi $14 628			$0				$0	
$0 Existing $87,699 $127	$0 Existing $87,699 $127	$0 Existing $87,699 $127	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	$0 Existing $87,699	Existing $87,699	Existing $87,699	Existing $87,699	Existing $87,699		Exi $87 699	Exi $87 699	$0	$0					$0	$0
$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	$0 Existing $18,529	Existing $18,529	Existing $18,529	Existing $18,529	Existing $18,529	Existing $18,529	$18,529	$18,529	$18,529	$0	$0					$0	
$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	$0 Existing $96,390 $127	Existing $96,390 $127	Existing $96,390 $127	Existing $96,390 $127	Existing $96,390 $127	Existing $96,390 $127	Exis $96,390 $127	Exi $96 390 127	Exist $96,3 $127	$0						$0	
$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	$0 Existing $28,378	Existing $28,378	Existing $28,378	Existing $28,378	Existing $28,378	Existing $28,378		Exi $28 378	Exi $28 378	$0		$0				$0	
$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	$0 Existing $75,058 $127	Existing $75,058 $127	Existing $75,058 $127	Existing $75,058 $127	Existing $75,058 $127	Existing $75,058 $127			Ex $75,058 $127	$0	$0					$0	$0
$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	$0 Existing $39,788 $127	Existing $39,788 $127	Existing $39,788 $127	Existing $39,788 $127	Existing $39,788 $127	Existing $39,788 $127		Existing $39,788 $127	Exi $39 788 127	$0		$0				$0	
$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	$0 Existing $36,570	Existing $36,570	Existing $36,570	Existing $36,570	Existing $36,570		Existing $36,570		$0		$0					
$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	$0 Existing $31,694	Existing $31,694	Existing $31,694	Existing $31,694		Existing $31,694		$0	$0					$0	$0
$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323 $127	$0 Existing $73,323	$0 Existing $73,323	$0 Existing $73,323	Existing $73,323	Existing $73,323	Existing $73,323	Existing $73,323	Existing $73,323	Exi $73 323	Existing $73,323	Exi $73 323	$0	$0					$0	$0
$0 Existing $123,727 $127	$0 Existing $123,727 $127	$0 Existing $123,727 $127	$0 Existing $123,727	$0 Existing $123,727	$0 Existing $123,727	$0 Existing $123,727	$0 Existing $123,727	$0 Existing $123,727	$0 Existing $123,727	$0 Existing $123,727	$0 Existing $123,727	Existing $123,727	Existing $123,727	Existing $123,727	Existing $123,727	Existing $123,727	Exi $123 727	Existing $123,727	Exi $123 727	$0	$0					$0	
$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453 $127	$0 Existing $75,453	$0 Existing $75,453	Existing $75,453	Existing $75,453	Existing $75,453	Existing $75,453	Existing $75,453	Exi $75 453	Exi $75 453	Existing $75,453	$0	$0					$0	
$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	$0 Existing $263,492 $127	Existing $263,492 $127	Existing $263,492 $127	Existing $263,492 $127	Existing $263,492 $127	Existing $263,492 $127	Existing $263,492 $127	Existing $263,492 $127	Existing $263,492 $127	$0		$0				$0	
$0 Existing $127,993 $127	$0 Existing $127,993 $127	$0 Existing $127,993 $127	$0 Existing $127,993	$0 Existing $127,993	$0 Existing $127,993	$0 Existing $127,993	$0 Existing $127,993	$0 Existing $127,993	$0 Existing $127,993	$0 Existing $127,993	$0 Existing $127,993	Existing $127,993	Existing $127,993	Existing $127,993	Existing $127,993	Existing $127,993	Existing $127,993	Existing $127,993	Existing $127,993	$0	$0					$0	$0
$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	$0 Existing $40,568	Existing $40,568	Existing $40,568	Existing $40,568	Existing $40,568	Existing $40,568	Existing $40,568	Existing $40,568	Existing $40,568	$0		$0				$0	

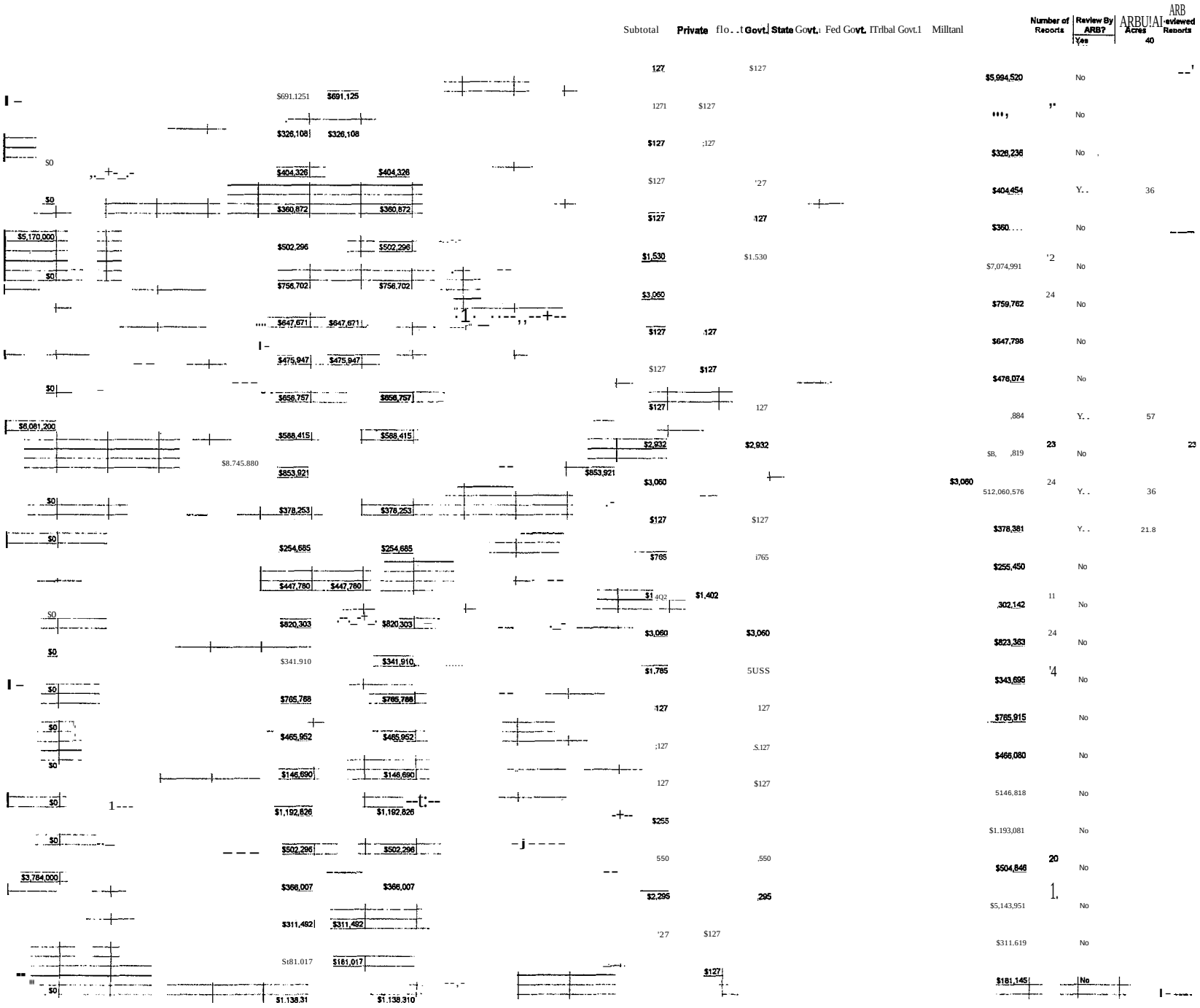
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Capital Costs Subtotal	Priv_	Local 00	State Govt.	Fed Govt.	Tribal Govt.	Milita	Annual Operation & Subtotal	Private
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127														
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0			$0					
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Ex g	Existing	Existing	Existing	Existing								$0	
$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909	$42,909									
$127																												
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							$0			$0					
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing		Existing	Existing	Existing	Existing								$0	
$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68,166	$68'66	$68'64	$68,166	$68,166	$68,166									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0	
$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967	$20,967									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0									$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existi g	Existing	Existing	Existing								$0	
$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042	$140,042									
$127	$127	$127	$127	$127	$127	$127																						
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Ex	Ex	Ex	Ex	q	Existing	Existing	Existing								$0	
$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16,676	$16678	$16678	$16,676	$16,876	$16,676	$16,676	$16,676									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0									$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Ex	Ex	Ex	Existing	Existing	Existing	Existing	Ex								$0	
$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082	$36,082									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0									$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exis	Existing	Existing	Existing	Existing	Ex								$0	
$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,859	$90,	$90,859	$90,859	$90,859	$90,859	$90,									
$127	$127	$127	$127	$127	$127	$127	$127																					
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0									$0								
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0	
$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063	$25,063									
$127	$127	$127	$127	$127	$127																							
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0									$0					$0			
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0	
$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669	$185,669									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Ex								$0	
$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,272	$48,	$48,272									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127												
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0					$0	
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Exi										
$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175,003	$175	$175,003									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127	$127														
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Ex	Ex	Ex	Exi	Exi								$0	
$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33,254	$33	$33254	$33	$33	$33									
$127	$127	$127	$127	$127	$127	$127	$127	$127	$127																			
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Ex	Ex	Existi	Exi								$0	
$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958	$40,958									
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0								$0		$0						
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing								$0	
$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413	$62,413									
$13,298,647	$13,298,520	$13,298,392	$13,667,650	$15,589,506	$15,589,379	$15,588,996	$15,588,359	$15,587,976	$15,587,721	$15,587,084	$15,586,829	$14,815,331	$13,977,179	$13,888,846	$13,888,591	$13,888,463	$13,888,336	$13,887,953	$13,763,842	$335,348,090								
$505,922	$505,922	$505,922	$505,922	$541,593	$541,593	$541,593	$541,593	$541,593	$541,593	$541,593	$541,593	$253,435	$35,671	$35,671	$35,671	$35,671	$35,671	$35,671	$0	$8,123,895								
$1,225,800	$1,225,800	$1,225,800	$1,225,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$43,172,000								
$2,380,346	$2,380,346	$2,380,346	$2,517,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$59,626,482								
$2,677	$2,677	$2,677	$2,295	$2,295	$2,295	$2,167	$1,785	$1,657	$1,530	$1,275	$1,275	$1,147	$1,020	$1,020	$892	$892	$765	$765	$765	$47,044								
$1,191,297	$1,191,297	$1,191,297	$1,191,297	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$796,396	$176,263	$88,312	$88,312	$88,312	$88,312	$0	$19,194,131								
$3,962,180	$3,962,180	$3,962,180	$3,962,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$104,458,400								
$4,024,306	$4,024,306	$4,024,306	$4,257,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$100,604,768								
$6,120	$5,992	$5,865	$5,737	$5,610	$5,482	$5,227	$4,972	$4,717	$4,590	$4,207	$3,952	$3,952	$3,825	$3,442	$3,315	$3,187	$3,187	$2,805	$2,677	$121,370								
$1,697,218	$1,697,218	$1,697,218	$1,697,218	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,049,831	$211,934	$123,983	$123,983	$123,983	$123,983	$0	$27,316,026								
$6,187,980	$6,187,980	$6,187,980	$6,187,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$147,630,400								
$6,404,852	$6,404,852	$6,404,852	$6,774,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$160,231,250								
$9,797	$9,669	$9,542	$9,032	$7,904	$7,777	$7,394	$6,767	$6,376	$6,120	$5,482	$5,227	$5,100	$4,845	$4,462	$4,207	$4,080	$3,952	$3,570	$3,442	$168,414								
$13,298,647	$13,298,520	$13,298,392	$13,667,650	$15,589,506	$15,589,379	$15,588,996	$15,588,359	$15,587,976	$15,587,721	$15,587,084	$15,586,829	$14,815,331	$13,977,179	$13,888,846	$13,888,591	$13,888,463	$13,888,336	$13,887,953	$13,763,842	$335,348,090								

Reporting Costs from "Landfills_Reporting_Only" worksheet:

	Subtotals	Private	Local Govt.	State Govt.	Fed Govt.	Tribal Govt.	Military
	$139,178						
		$10,098					
			$87,994				
				$3,769			
					$12,641		
						$0	
							$24,676

$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$1,663,718	$892,348	$87,951	$0	$0	$0	$0	$0	$0	$24,955,774								
$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$4,091,980	$91,678,400								
$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$354,311	$8,919,405								
$765	$765	$765	$765	$765	$765	$765	$510	$382	$382	$382	$382	$382	$382	$255	$255	$255	$255	$255	$127	$14,661								
$6,110,775	$6,110,775	$6,110,775	$8,110,775	$6,110,775	$6,110,775	$6,110,775	$6,110,520	$6,110,392	$6,110,392	$6,110,392	$6,110,392	$5,339,021	$4,534,625	$4,446,546	$4,446,546	$4,446,546	$4,446,546	$4,446,546	$4,448,419	$125,568,241								
$33,500	$33,500	$33,500	$33,500	$157,483	$157,483	$157,483	$157,483	$157,483	$157,483	$157,483	$157,483	$157,483	$123,983	$123,983	$123,983	$123,983	$123,983	$123,983	$0	$2,362,252								
$1,096,000	$1,096,000	$1,096,000	$1,096,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$3,066,000	$55,852,000								
$6,050,341	$6,050,341	$6,050,341	$6,420,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$6,228,109	$151,311,844								
$9,032	$7,904	$7,777	$7,267	$7,139	$7,012	$6,629	$6,247	$5,992	$5,737	$5,100	$4,845	$4,717	$4,462	$4,207	$3,952	$3,825	$3,697	$3,315	$3,315	$153,753								
$7,187,873	$7,187,745	$7,187,618	$7,556,876	$9,478,732	$9,478,604	$9,478,222	$9,477,839	$9,477,584	$9,477,329	$9,476,692	$9,476,437	$9,479,309	$9,442,554	$9,442,299	$9,442,044	$9,441,917	$9,441,789	$9,441,407	$9,317,424	$209,779,849								
$13,298,647	$13,298,520	$13,298,392	$13,667,650	$15,589,506	$15,589,379	$15,588,996	$15,588,359	$15,587,976	$15,587,721	$15,587,084	$15,586,829	$14,815,331	$13,977,179	$13,888,846	$13,888,591	$13,888,463	$13,888,336	$13,887,953	$13,763,842	$335,348,090	Total							
																			$335,348,090		All LFs Subj. to C						

$147,630,400 $43,172,000 $16,736,415 $0 $0 $2,457,716


Subtotal
Private
flo..t Govt.
State Govt.
Fed Govt.
ITribal Govt.1
Milltanl
Number of Reports
Review By ARB?
ARBU!AI Acres
ARB eviewed Reports
$691.1251
$691,125
$326,108
$326,108
$0
$404,326
$404,326
$0
$360,872
$360,872
$5,170,000
$502,296
$502,296
$0
$756,702
$756,702
$647,671
$647,671
$475,947
$475,947
$0
$656,757
$656,757
$6,091,200
$588,415
$588,415
$8.745.880
$853,921
$853,921
$0
$378,253
$378,253
$0
$254,685
$254,685
$447,780
$447,780
$0
$820,303
$820,303
$341.910
$341,910
$0
$765,788
$765,788
$0
$465,952
$465,952
$0
$146,690
$146,690
$0
$1,192,826
$1,192,826
$0
$502,296
$502,296
$3,784,000
$366,007
$366,007
$311,492
$311,492
St81.017
$181,017
$0
$1.138.31
$1.138.310
127
$127
1271
$127
$127
;127
$127
'27
$127
127
$1,530
$1.530
$3,060
$127
127
$127
$127
$127
127
$2,932
$2,932
$3,060
$127
$127
$765
i765
$1
4Q2
$1,402
$3,060
$3,060
$1,765
5USS
127
127
;127
.S.127
127
$127
$255
550
,550
$2,295
,295
'27
$127
$127
$5,994,520
No
$326,236
No
$404,454
Y..
36
$360....
No
$7,074,991
'2
No
24
$759,762
No
$647,798
No
$476,074
No
,884
Y..
57
$B, ,819
23
No
23
$3,060
512,060,576
24
Y..
36
$378,381
Y..
21.8
$255,450
No
,302,142
11
No
$823,363
24
No
$343,695
'4
No
$765,915
No
$466,080
No
5146,818
No
$1.193,081
No
$504,846
20
No
$5,143,951
No
$311.619
No
$181,145
No

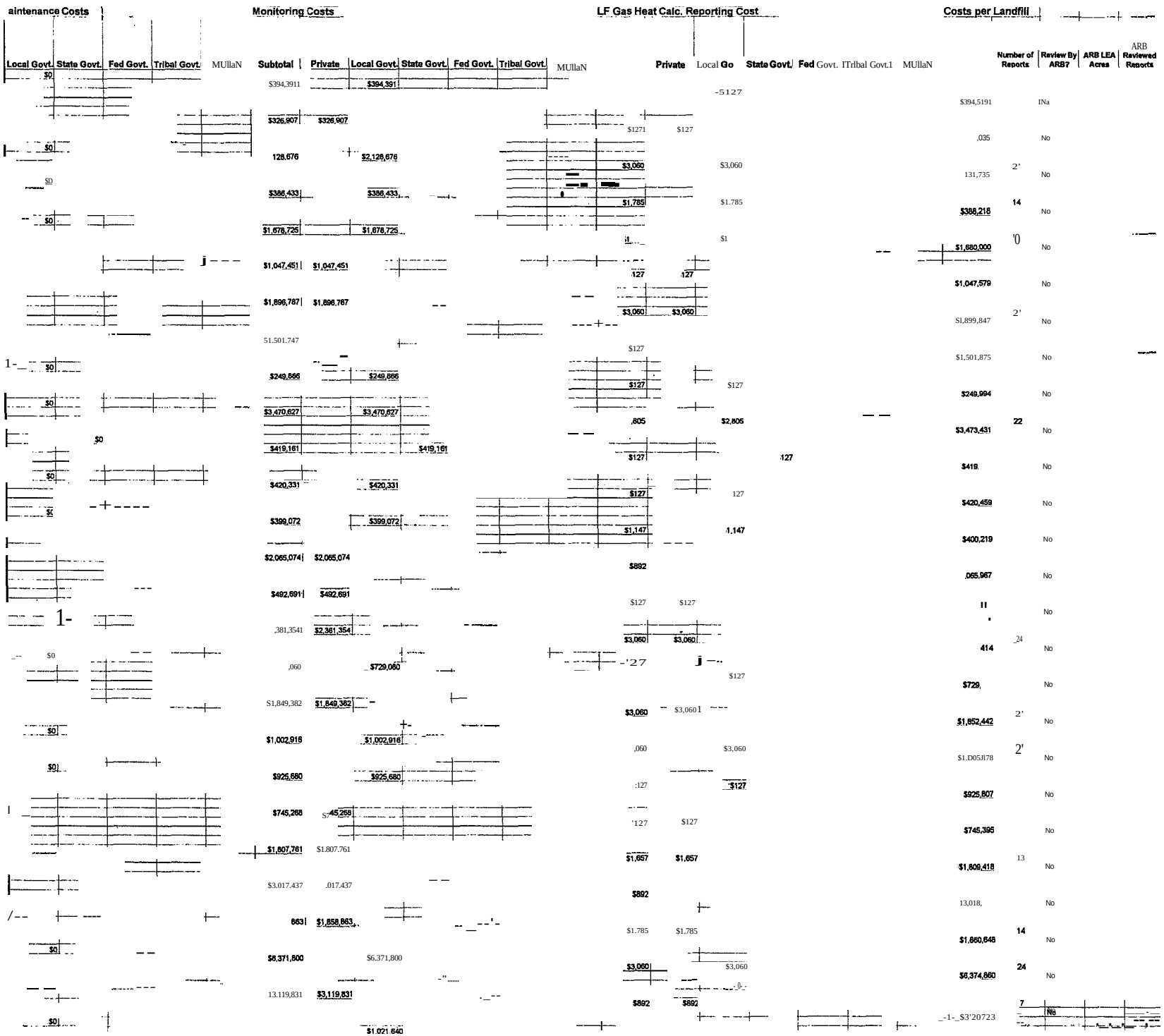
Maintenance Costs | Monitoring Costs | LF Gas Heat Calc. Reporting Cost | Costs per Landfill

Local Govt.	State Govt.	Fed Govt.	Tribal Govt.	Military	Su_1	Private	Local Govt.	State Govt.	Fed Govt.	Tribal Govt.	Military	Subtotal	Private	Local Govt.	State Govt.	Fed Govt.	Tribal Govt.	Military	Number of Reports	Review By ARB?	ARB LEA Acres	ARB Reviewed Reports
$0					,071		,071					127		$127				$1,138,436	1	No		
					$275,148		1048					127		;127				$552,199		No		
$0					$1,410,888		$1.410,888					127		$127				$276 15	1	No		
$0					$891.015		11.0t5					127		127				$1411015	1	No		
$0					$162,684		$162,684					127		- $127				$891,143	1	No		
$0					$353,		,287					$3,060		,060				$165,743	24	No		
$2,550,400							,902					$1,785		$1,785				$355,072	14	No		
$0					$417.757		$417,757					127		127				$3,224,520	1	No		
,439,000					$427,238		$427,238					,060		$3,060				$420,817	24	No		
					,708	$421.708						;127		127				$5,994,520	1	No		
$0					$806,477		$806,477					$127 1		$127				$421,835		No		
$0					,905		$863,905					$3,060		$3.060				$809,537	24	No		
					$391,685	$391						127		$127				$884,032		No		
430,600					$429,609		$429,609					167	52.167					$393,852	17.	INo		
					$328,858		,858					;10		ID				$6,043,675		No		
SO'					$647,671		.5"					-$127		-$127				$328,985		INo		
$0					$223,536		,536					$2,805		$2,805				$650,476	22	No		
					$360,872	$360,872						127		127				$223,663		INo		
$0					$967,653		$967,653					,27	127					$360,999	1	No		
					$188,429		$188,429					$127		$127				$967,781		No		
					5910,7671	$910,767						$127		$127				$188,556		No		
$0					$285,754		$285,754					$1271	$127					$910,895		No		
$0					,052		,052					905		805				$288,559	22	No		
					$593,155		155					127		"27				$685,180		INo		
					$465,952	$465,952						060		,060				$596,215	24	No		
$0					'62		162					$127\		"27				$466,080		No		
												$1.912		$1.912								

aintenance Costs | Monitoring Costs | LF Gas Heat Calc. Reporting Cost | Costs-Der Landfill

Local GoW	State Oortl	Fed Gart ITribai Govt.	Local Govt.	State Govt.	1 Fed Oovt.IT,lbal 00vt.1	Military	Subtotal 1	Private	Local Govt.	State 00vt.1	Fed Oovt.IT,lbal OoYl	Militarv	Number of Reports	Review By ARB?	ARB LEA Acres	ARB Reviewed Reports
$4,670,400																
	$0			$456,471			$127			$127			$6,446,261		No		
			$1.090.906	$1,090,906												
	$0		$282,048	$282048			$127			$127			$1.091.033		No		
							$'27			5127						
	$0		$207,250	$207,250			$127			$127			17S1	1	INo		
	$0		$1,316,868	$1,316,868			$127			$127			$207,378		No		
$10,009,600			$1,008,342	$1 008 342			127			127			$1,316,998		No		
	$0									.5127						
			$1,438,146	$1,438,146			167			167			$11,429,160		No		
														17		
			$699,816	$699,816			$127			$'27			$1,440,313		No		
	$0															
			$251,817	$251,817			$127			$127			$899,943		No		
	$0															
			$1,185,715	$1,185,715			$127			$127			$251,944		No		
	$0															
			$1,229,170	$1,229,170			$127			$127			$1,185,843		No		
	$0															
			$1,090,906	$1,090,906			$127			$127			$1.229,297		No		
$12,476,120																
			$1,216,054	$1,216,054			$1.402			$1.402			$1,091,033		No		
$9,790,000														11		
			$956,592	$956,592			$510			510			$17,093,179		No		
			$1,547,177	51.547.177"			,060			,060			$13,513.3191		No		
	$0													2•		
			$1,422,739	$1,422,739			$127			$127			$1,550,237		No		
			$711,272	$711,272			$127			127			$1,422,867		Yes	73	
	$0		$747,616	*5747,616*			,060			,060			$10,035,689		No		
	$0		$2,292,222	$2,292,222			$1,912			$1,912			$750	2.	No		
	$0		$1,810,668	$1,810,668			$127			127			$2,294,135	15	No		
	$0		$1,728,895	1,728,895			,060			,060			$1.810.796		No		
	$0		$2,095,887	$2,095,887			,275						$1,731,955	2•	No		
	$0		$2,370,835	,370,835			1,020			1,020			$2,097,162	1,	No		
	$0		$626,339	$626,339			$1,530			;1,530			$2.311.855		No		
			$455,681	$455,681			$1,785			;1,785			$627....	12	No		
	$0		$1,274,599	$1,274,599			$2			$2,295			$457,466	14	No		
	$0		$1,020,193										$1,276,894	11	No		

Maintenance Costs						Monitoring Costs							LF Gas Heat Calc. Reporting Cost						Costs per Landfill				
Local Govt.	State Govt.	Fed Govt.	Tribal Govt.	Military	Subtotal	Private	Local Govt.	State Govt.	Fed Govt.	Tribal Govt.	Military	Subtotal	Private	Local Govt.	State Govt.	Fed Govt.	Tribal Govt.	Military		Number of Reports	Review By ARB?	ARB LEA Acres	ARB Reviewed Reports
												"27		$127					$1,020,321		N		
$0					$1,375,334		$1,375,334					.060		$3,060					$1,378,394	24	No		
					$1,559,028	$1,559,028						060	,060										
					$847,561	$847,561							$382										
$0					697		$303,697							$892									
					$213,199	-5213199						'27	"27										
					52410339	$2410						.060	$3,000										
					$' D38	$1038365						'27	$127										
$0					$344,071		$344,071					.060		060									
					$1,536,511	$1,536,511						;10	"										
$24,112,000					$2 364,910		$2,364,910					060		.060					S26 ,470				
					$1,138,310	$1,138,310						$1,402	$1,402						1,139,713				
$0					$730,629		$730,					$127		127					$730,757	1	No		
					$209,493	$209,493													$209,621		No		
$0							$2,238,102							060					$2,241,162	24	No		
$3,760,000					$383,784		$383 784							,060					,649,344	24	No		
					$4,532,494		$4,532,494							$3,000					$4,535,554	24	No		
					$543,380	$543,380													$543 5D6	1	No		
$0					$1,166,753		$1166753					$1,402		$1,402					$1,168,156	11	No		
$0					$3,281,007		$3,281,007					$3,060		$3,060					$3,284,067	24	No		
					$2,873,721	$2873721						$2,040	$2,040						,875.7611-	]'	No		
					$3 034,502		$3,034,502					060		$3,060						24	No		
					$696 ,'	$696 15						,1271	$127							'	No		
					$231 923		$231,923					1271		$127					$232,050	I	No		
					$920 48		$920 48					$2,295		$2,					$922,543	18	No		
$0					$375667 .		$375,667					127		127					$375,795		No		
1--.					$2,029,521	$2,029,521														3	No		


aintenance Costs
Local Govt.
State Govt.
Fed Govt.
Tribal Govt.
MUllaN
Monitoring Costs
Subtotal
Private
Local Govt.
State Govt.
Fed Govt.
Tribal Govt.
MUllaN
LF Gas Heat Calc. Reporting Cost
Private
Local Go
State Govt.
Fed Govt.
ITrlbal Govt.1
MUllaN
Costs per Landfill
Number of Reports
Review By ARB?
ARB LEA Acres
ARB Reviewed Reports

aintenance Costs

Monitoring Costs

LF Gas Heat Calc. Reporting Cost

Loca. Govt. | State Govt. | Fed Govt. | Tribal Govt. | Military | Subtotal | Private | Loca. Govt. | State Govt. | Fed Govt. | Tribal Govt. | Military | Subtotal | Private | Local Govt. | State Govt. | Fed Govt. | Tribal Govt.

$0
$0
$1,034,902 $1,034,902
$1,615,829 $1,615,829
$530,236 5530
409,000 $3,409,000
$431,546 $431,548
$913 $91 978
52 621 52 621
$649 503 $649 503
$0
$4,504.05
$1,158 $1,158,265
$4073063 $4073063
$812849 $812,849
$990,043 $990,043
$1,483,494 $1,483,494
$160,231
$95,712,520 $59,626,482 $94,827,634
$0 $0 $0 $0
$8,745,880

422 $2,422
080 $3,060
$4,504,051
$255
$2,677 $2,677
422 422
$1,657 $1,657
10.
$510 $510
15'.
$168,414
$47,044 $117.928 $127
$0 $0
$419,161
$0 $0
$5,357,972

No
$431,674 1 No
$914,105 1 No
12 No
10 No
$4,504,306 2 No
$1,160,942 21 No
$4 75,485 19 No
$814,507 13 No
$990,553 4 No
$1,484,004 1321 265.' 33'
$335,348,090
6 # for ARB Review
1,982,470 140 # for District Review
$146,818

487 Per-Ca Subtotals (sectors)
$110,979,519 Private Sector
$207 482 Local Govt. Sector
$423 058 State Govt. Sector
12641 Fed. Govt. Sector
$0 Tribal Govt. Sector
$3,315 516 559 Mitig. S
I II Total Re Cost

Worksheet 3

Cost Subtotals

5nJ200s

Note: See staff report (Appendix F) for additional discussion and more detailed information (Including reference citations.)

1. Weste-in-Place (W1P) Report Preparation & Submittal

Assumptions:
1) Landfills are currently required to submit periodic WIP reports to the California Integrated Waste Management Board.
2)Thls cost estimate assumes that a recent CIVVMB report will either be updated or copied and submitted to ARB.
3) No allowance is given for office overhead, supplies. etc., since these are minimal cost items given the short duration and scope of thls work assignment.

Cost:			
Enginee·ring Staff Time:	2 hOUlS@	61.77 $lhr. =	$124
Clerical Staff Time:	1 hOUlS@	43.85 $lhr. =	$44
WIP Report Preparation & Submittal Cost:			$167

Ref.: USDL, 200gb

2. Calculation of Landfill Gas Heat Input Capacity

Assumptions:
1) Time needed to prepare and submit Calculation as outlined in proposed regulation.
-2) No allowance ls given for office overhead, supplies, etc., since these are minimal cost Items given the short duration and scope of this work assignment.

Cost			
Engineering Staff Time:	1.5 hours @	65.14 $/hr. =	$S8
Clerical Staff Tlme:	1 hours @	2S.78 $/hr. =	$30
Calculation of Landfill Gas Heat Input Capacity Cost:			$127

Ref.: USDL, 200Sb

3a. Surface Emissions/Contol & Collection System Monitoring-Capital Cost

Assumptions:
. Monitoring eqUipment to be used by landfills will be the same as used by ARB for reg. enforcement.

Monitoring Equipment Capital Cost:			$48,000	$48,000
Includes the following:				
(3) Portable Organic Vapor Analyzers	@	$5,000 ea. =	$15,000	
(1) Calibration System	@	$3,000 ea. =	$3,000	
(3) Vacuum Measuring Devices	@	$l,OOOaa, =	$3,000	
(3) Portable oxygen Analyzers	@	$3,5000a. =	$10,500	
Spare Parts		$500=	$500	
Tools		*$1,000* =	$1,000	
(3) Dalalogglng Systems	@	$5,000 =	$15,000	
			$48,000	

3b. Surface Emissions/Contol & Collection System Monitoring--Cost per Landfill-Acre

Assumptions:
Includes calibration of monitor and downloading of monitoring data from datalogger.

Increased Monitoring Cost (SCAQMD only):					
	Engrg. Tech. Staff Time:	0.5 hours @	48.76	$/hr. =	$24 Per-Acre Cost:
Monitoring Cost + Sur1ace Maintenance Allowance (non-SCAQMD landfills):					
	Engrg. Tech, Staff Time:	1 hOUlS @	48.76	$/hr. =	$49 Per-Acre Cost:
	Improved Surface Maintenance Cost Allowance:		50	$IAC =	$50
					$99 Total Per-Acre Cost

Ref.: USDL, 2009b

4. Upgrade of Existing Collection/Control System-Capital Cost

Assumptions:
For landfills with existing open flare systems, work to be perfonned will consist of changeout of existing control device to a new enclosed flare.
Ref.: John Z1nk Co. "ZTOF" model

Enclosed Flare Cost Lookup Table [6]

Flare Size (MM BtulHr.l	CeUvered Flare Cost'	Flare Installation [2]	Permits [3]	S1art-up Source Test [4]	Misc. [5]	TotalCDst
3.0	$174,590	$30,000	$5,000	$25,000	$50,000	**$284,590**
6.1	**$189,405**	$33,462	$5,000	$25,000	$50,000	$303,867
10.6	**$207,490**	$36,924	$7,000	825,000	$50,000	$326,414
18.2	9224,486	540,386	$6,000	825,000	$50,000	$347,872
27.3	8242,571	**$43,848**	$9,000	825,000	$50,000	$370,419
39.5	8265,018	547,310	$10,000	$25,000	$50,000	$397,326
51.8	8285,281	$50,772	$15,000	825,000	$50,000	5426,053
86.8	$305,546	554,234	820,000	825,000	$50,000	$454,780
81.9	$325,812	$57,696	825,000	825,000	$50,000	$483,508
100.2	**$348,077**	'$51,158	$30,000	$25,000	$50.000	$512,235
115.4	$386.342	**$64,620**	$35,000	825,000	$50,000	$640,962
136.8	$386.807	$58,082	540,000	825,000	$50,000	$569,589
182.1	$596,090	$71,544	545,000	825.000	$50,000	$787,__
364.3	$1,001,430	$75,000	$50,000	$25.000	$50,000	$1,201,430
546.5	**$1,001,430**	$150,000	$55,000	$50.000	$50,000	$1,305,430
728.6	$1.408,770	$225,000	$50,000	$75.000	$50,000	$1,816,770
910.8	$1.812,110	$300,000	$55,000	$100.000	$50,000	$2,327,110
	82.217,450	$375,000	$70,000	$125.000	$50.000	$2,837,450

Delivered Flare Cost Construction Table

	Flare stack & Controls	Propane Pilot GasSvstem	Blower Skid	Tranportatlon TaSKe	Delivered Flare Cost
3	$75,000	$1,000	$75,000	$10,000	$174,590
6	$50,000	$1,000	$60,769	$13,077	**$189,405**
11	$66,000	$1,000	$86,538	$18,154	$207,490
18	$95,000	$1,000	$92,307	$19,231	**$224,486**
27	$103,000	$1,000	$98,078	922,308	$242,571
39	$115,000	$1,000	**$103,845**	825,385	$265,018
52	$125,000	$1,000	$109,814	**$28,462**	8285,281
87	$135,000	$1,000	$115,383	$31,539	$305,546
82	$145,000	$1,000	$121,152	534,816	$325,812
100	$155.000	$1,000	$126.921	$37,893	$346,077
115	$185,000	$1,000	$132.890	540,770	**$386,342**
137	$175.000	$1,000	$138.459	**$43,847**	$386,607
182	$350.000	$1,000	$150,000	$50.000	$596,090
384	$525.000	82,000	$300,000	$100.000	**$1,001,430**
546	$700,000	$3,000	5450,000	$150,000	$1,408.770
728	$575,000	54,000	$500,000	8200,000	$1,812.110
911	$1.050,000	$5,000	$750,000	$250,000	82,217.450
	51,050,000	$5.000	$900,000	$300,000	**$2,432,040**

, **Includes the following: enclosed flare cost (includes stack .control panel, flame arrester, safety shutoff valve, now meter. and chart recorder), $1.000 for propane pilot gas system. tranportatlon to CA (not taxed), and 9% sales tax.**
2 **Includes site evaluation, application engineering, and aduallnstallaUan work.**
3 Includes air district (application & authority-to-construct fees) and building permits•
4 Source test *far* criteria pollutants and CH4 (EPA Method 16) to ensure permit compliance.
5 Allowance for electrical service work, Including line extension and service drop work, etc.
6 182 MM BtulHr. (about 6,000 SCFM) is the largest stock single enclosed flare size; larger sizes assume using multiple flares as reqUired for control.

Rof.: Locke, 2009a, Lacko 2009b

Sa. Instellation of New Collection and Control System-Capital Cost
Assumptions:
includes site assessment, design and installation of collection and control systems (enclosed flare assumed as control technology choice)

2007$	2008$			
$18,000	$18,900		**cosU LF acre:'**	$18,900
			SQurce Test:	$25,000

Ref.: U.S. EPA. 2009

5b. Annual Operation & Maintenance Cost of New Collection and Control System

2007$	2008$			
4.000	4:200		**CasU LF acre:**	54,200
		$25,000	$0	$25,000
		Source Test	**Misc..**	

Ref.: U.S. EPA, 2009

6. Costs to ARB for Enforcement and Outreach Activities

Note: Items 6a through 6e are used to calculate the low end of the cost range, *6t* through 61 are used to calculate the high end of the cost range.

Calculation of ARB Loaded Labor Rate Used for Estimation Purposes (includes benefits, overhead, etc.):

ARB Annual Employee loaded Cost = $170,000' Number of Employee Production HoursfYr.: 1,904

$170,000/1,904 = $09.29/hr.

Ref.: Ford, 2009'

6a: ARB Enforcement-Site Inspections & Associated Work (low end of cost range)

Assumptions:

1) SiX landfills located in local air districts *w/o* delegated LEA authority from ARB wlll be Inspected annually by ARB for enforcement purposes.
2) Three of the six landfills are remotely located, requiring additional travel time beyond that for a typical Inspection.
3) A typical inspection Is a one-day trip *w/o* overnight lodging, but includes limited (4hrs.) *orr. Orr* = 1.5x norma.l pay rate.
4) A remote inspection Includes two nights' lodging expenses + per-dlem and two days for travel.
5) Landfill population Is relatively stable over tIme- no large Increases in the number of landfills.

				Monitoring Equipment $48,000			One-Time Eg. Cost $48,000
	# of Landfills	Travel (unit cost	Travel Cost Subtotal	Labor (hrs./tnsp.l	Labor Cost Subtotal		
Typical Inspection:	3	$80	$240	14	$3,750	Annual	Annual
Remote Inspection:	3	$520	$1,580	24	$0,429	Travel Cost	Labor Cost
			$1,800		$10,179	$1,800	$10,179

6b. ARB Enforcement-Design Plan Reviews (low end of cost range)

Assumptions:

1) Each intial Design Plan review by ARB staff Includes 12 hrs. for a site visit.
2) 25% of Design Plans submitted will be updated and resubmitted annually.
3) Landfill population Is relatively stable over time- no large Increases in the number of landfills.

Initial Design Plan Revlew[1]:

30 hours@ 89.29 $/hr. = $2,679

Travel Costs (avg.): $240

Tolal: $2,919

Updated Design Plan Rev/awl:

8 hours @ 89.29 $/hr. = $714

Cost Calculation:

	#01 Affected Landfills	Labor CosV/Review	Review Cost Subtotal	One-Time Travel Cost	One-Time Labor Cost
Initial Review:		$2,679	$13,394	$1,200	$13,394
Update Review:		$714	$714		
					Annual Laboreos! $71.4

Ref.: Judge. 2009[1]

6c. ARB Enforcement-Monitoring Data Review (low end of cost range)

Assumptions:

1) Monitoring data review Includes staff lime to receive. review, and archive data.
2) Four monitoring reports per year are reviewed.
3) Landfill population Is relatively stable over Ume- no large Increases In the number of landfills,
4) Report review workload Is constant over the 23-year analysis period.

Review Cost per Reporting Cycle (expressed on a per-acre basis):

0.1 hours @ 89.29' $/hr. = $9

	Number Of Affected Landfil-	Review Cost ($Jacre)	Cost Subtotal	Annual Labor Cost
Report RevlelY:	266	$9	$2,373	$9,493

6d. ARB Enforcemeni-Review of W1P and Heat Calculation Reports (low end of cost range)

Assumptions:

1) Report review workload is constant overthe 23-year analysis period.
2) landfill population is relatively stable overtime- no large increases In the number of landfills.

Number of Reports Expected From Affected Landfills

Landfills Subject \0 Reponing Only:	567	
Landfills Subject to Reporting. Monitoring, & Controls:	33	
Total:	600	(over a 23-year period)

Estimated Review TImelReporl

1 hour(s)@ 89.29 $/hr. = 589

Cost calculation

	Number of Reports	CostlRevfew	Cost Subtotal	Annual Labor Cost
Report Review:	600	$89	**$53,574**	**$2,329**

6e. ARB Implementation-Qutreach and'Compliance Assistance.Activities (low end of cost range)

Assumptions:

1) Mallout audience is estimated 8t218 x 1.25 = 273; this is the 218 potentially afffected CA landfills plus 25% additional to include associated regulatory agencies (local air districts (35), CIIVMB. RWCB, and EPA). eqUipment and service providers, and other Interested parties.
2) Preparation of 75-page outreach document for landfIUs Is performed.

preoamtlon of Outreach Materials

(1) 75-page outreach document

ARB staffTime: 120 hours@ **89.29 $/hr. =** 510.715

	(# of units)	(cost/unit)	Quantity		
Reproduction Costs:					
400 copies =273 + 127 extras	75	$0.04	400	51,200	
Mailout:					
cover letter		50.04	273	$22	
envelope		$0.72	273	5197	
postage (8 oz.) (after 5109 rate Increase)		52.07	273	$565	
					51,984

'Inronnational Workshop(s)

(Outreach materials & staff time costs covered/absorbed in current budget allocation.)

Travel- one person/one week **$1,200**

Trade ShOW Attendance

(SlafftIme costs covered/absorbed In current budget allocation.)

Travel- one person/one week	51.200	**One-TIme Non-labor Expenses**	**One-Time Travel Exp.**
Registration Fees	$500	**$2,484**	52.400

One-Time Labor Cost 510.715

Low-End of Cost Range Summary

	Cost ($)
Annual (Recurring) costs:	
ARB staffTime	$22,716
Travel	51,800
	524.516

"Low-End Annual Costs to ARB are approximately $24.500."

One-Time Costs:	
ARB Staff Time	524.108
Travel	**$3,600**
Monitoring Equipment + MaUoui Expenses	$50,484
	578,192

"Low-End One-Time 'Costs \0 ARB are approxImalely **$78,000."**

6f. ARB Enforcement--Site Inspections & Associated Work (high end of cost range)

Assumptions:

1) All California landfills will be Inspected annually by ARB for enforcement purposes.
2) landfill population Is relatively stable over time- no large Increases in the number of landfills.

Labor Cost
8 hrs./insp. + 1.3 hrs. travel allowance ::: 10 hrs./inspection
367 Landfills X 10 hrs. StaffTImelLandfill::: 3,670 hrs.
3,670 hrs./1,9D4 hrs. ~ 2 PYs
2 PYs x $170,OOOIPY' = $340,000

	Monitoring Equipment	One-Time Ea. Cost
	$ 48,000	. $ 48,000

Travel Cost
40% of Inspections on Per-Diem (-36.7 weeks/yr. for 2 PYs)

	Travel	Laboreost	Annual Travel Cost	Annual Labor Cost
	$44,040	$ 340,000	$44,040	$340,000

Cost for One Week of Travel (5 days, 4 nights)

Lodging	$580
Round-Trip Airfare	$240
Car Rental (incl. gas.)	$200
Food and Incidentals	$200
	$1.200

36.7 Travel Weeks/yr. x $1,200lWeek ::: $44,040

Ref.: Ford, 2009'

6g. ARB Enforcement-Design Plan Reviews (high end of cost range)

Assumptions:
1) Each Intial Design Plan review by ARB staff InclUdes 12 hrs. for a site visit.
2) 25% of Design Plans submitted will be updated and resubmitted annually.
3) Landfill population is relatively stable over time- no large Increases In the number of landfills.

Initial Design Plan Review':

30 hours @	89.29 $lhr. :::	$2,679	
Travel Costs (avg.):		$240	
	Total:	$2,919	

Updated Design Plan Review':

8 hours @	89.29 $/hr.	$714

Cost Calculation:

	# of Affected landfills	Labor CostlReview	Review Cost Subtotal	One-Time Travel Cost	One-Time . Labor Cost
Initial Review:	146	$2,679	$391,090	$35,040	$391,090
Update Review:	37	$714	$26,073		

Annual Labor Cost
$26,073

Ref.: Judge, 2009'

6h, ARB Enforcement-Monitoring Data Review (high end of cost range)

Assumptions:
1) Monitoring data review Includes staff time to receive, review, and archive data.
2) Four monitoring reports per year are reviewed.
3) Landfill population is relatively stable over time- no large Increases In the number of landfills.
4) Report review workload Is constant over the 23-year analysis period.

Review Cost per Reporting Cycle (expressed on a per-acre basis):

0.1 hour(s)@	89.29 $/hr.	$9

	Number of Affected Landfill-Acres	Review Cost ($lacre)	Cost Subtotal	Annual Labor Cost
Report Review:.	23,247	$9	$207,573	$830,292

6;' ARB Enforcement-Review of WIP and Heat Calculation Reports (high end of cost range)

Assumptions:
1) Report review workload Is constant over the 23-year analysIs period.
2) Landfill population Is relatively stable overtime- no large Increases in the number of landfills.

Number of Reports Expected From Affected Landfills

Landfills Subject \0 Reporting Only:	888
Landfills Subject \0 Reporting, Monitoring, & Controls:	1,321
Total:	2.209

Estimated Review T1me!R800rt

1 hour(s) @ 89.29 $/hr. = $89

Cost Calculation

	Number of Reports	Cost!Review	Cost Subtotal	Annual labor Cost
Raport Review:	2,209	$89	$197,242	$8,578

6j. ARB Implementation-Qutreach and Compliance Assistance Activities (high end of cost range)

Assumptions:

1) MaHout audience Is estimated at 372 x 1.25 = 465; this ir all of the 372 potentially afffeeted CA landfills plus 25% additional to include associated regulatory agencies (local **air districts** (35), **CIWMB,** RIIVCB, and EPA). equipment and **service providers,** and other Interested parties.

2) Preparation of 75-page outreach document **for landfills Is performed.**

Preparation of Outreach Materials

(1) **75-page** out",ach document

ARB Staff Time: 120 hour(s) @ 89.29 $/hr. = $10.715

	(# of units)	(cost/unit)	Quantity		
Reproduction Costs:					
500 copies = 465 + 35 extras	75	$0.04	500	$1,500	
Mallout: .					
cover letter		$0.04	485	$37	
envelope		$0.72	485	$335	
postage (8 oz.) (after 5/09 rate Increase)		$2.07	485	$963	
					$2.835

. Infonnatlonal Workshop(s)

(Outreach materials & staff time costs covered/absorbed In current budget allocation.)

Travel- one person/one week **$1,200**

Trade Show Attendance

(Staff time costs covered/absorbed In current budget allocation.)

Travel- one person/one week **$1,200**

Registration Fees $500

One-Time Travel Exp.	One-Time Non-Labor Expenses
52,400	$3.335

One-Time Labor Cost
$10.715

High-End of Cost Range Summary

	Cost ($)
Annual (Recurring) Costs:	
ARB Staff Time	$1,204,940
Travel	**$44,040**
	$1.248,980

"High-End Annual Costs to ARB are approximately 1.2 million dollars.-

One-Time Costs:	
ARB Staff Time	$401.805
Travel	$37.440
Monitoring Equipment + Mallout Expenses	$50.835
	$490.080

"High-End One-Time Costs to ARB are approximately 5490,000."

Worksheet 4

Estimated Cost-Effectiveness

(for the period 2010 to 2033, inclusive)

4/20/2009

This is the overall cost-effectiveness, where reporting requirement, collection and control system, and monitoring costs are summed and divided by the C02 reductions attributable to the proposed regulation (emission benefits for landfills in the SCAQMD excluded from the emission reductions listed below.)

1) Cost-Effectiveness of Proposed Regulation

Year [1]	Annual Cost [2] ($)	Emission Red. [3] (MTC02E)	Cost-Effectiveness ($/MTC02E)	
2010	$6,404,217	1,163,439	5.50	**Low**
2011	$11,356,839	1,198,633	9.47	
2012	$14,052,745	1,234,336	11.38	**High**
2013	$13,306,546	1,270,563	10.47	
2014	$13,305,574	1,307,328	10.18	
2015	$13,305,151	1,344,646	9.89	
2016	$13,304,856	1,382,532	9.62	
2017	$13,673,947	1,421,002	9.62	
2018	$15,595,468	1,460,071	10.68	
2019	$15,595,341	1,499,756	10.40	
2020	$15,594,456	1,540,071	10.13	
2021	$15,593,819	1,581,034	9.86	
2022	$15,592,974	1,622,662	9.61	
2023	$15,592,424	1,664,971	9.36	
2024	$15,591,659	1,707,980	9.13	
2025	$15,591,404	1,751,704	8.90	
2026	$14,819,906	1,796,163	8.25	
2027	$13,981,754	1,841,375	7.59	
2028	$13,893,086	1,887,358	7.36	
2029	$13,892,536	1,934,132	7.18	
2030	$13,892,114	1,981,715	7.01	
2031	$13,891,986	2,030,127	6.84	
2032	$13,891,604	2,079,389	6.68	
2033	$13,766,863	2,129,520	6.46	
	$335,487,268	38,830,509	8.64	Avg.

[1] These are the individual years in the analysis period.

[2] Annual costs are the sum of the reporting, collection and control systems improvements, and monitoring costs for all affected CA landfills (including those in the SCAQMD.) Costs are from the Landfills_Reporting_Only and Landfills Controlled worksheets in this file.

[3] Emission reductions are for all affected CA landfills except for those in the SCAQMD.

Worksheet 5 'Cost Summary

5/4/2009

1) **Costs** far **Landfills** SUbject to Reporting Requirements Only
(projected to have less than 450,000 tons **WIP**)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Private LFs:	$2,9B9	S482	5482	5482	S482	5482	$462	S482	S482	5462	$482	$482	$295	S295	$295	$295	5295	$295	. $127
GoVernment LFs (all):	$14,163	57,428	$7,094	$6,799	$6,464	56,169	$6,002	$5,834	$5,500	55,500	$4,997	$4.997	$4,703	$4,408	$4,280	$4,280	$4,280.	$4.280	$4,113
Local:	$11,055	$4,950	$4,615	$4,448	$4.113	53,985	$3,985	$3,985	·53,818	53,818	$3,316	$3,316	$3,316	$3,021	$2.893	$2,893	$2,893	$2.893	$2,726
State'	$295	$295	$295	$295	$295	$127	$127	$127	5127	$127	$127	$127	$127	5127	$12.7	$127	$127	$127	$127
Federal:	$1,387	$757	$757	$630	5630	$630	$630	$462	$462	$462	$462	$462	$462	5482	5482	S482	5482	S482	$462
Tribal:	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	SO	$0	SO	SO	SO	SO	SO
Military:	$1,427	$1,427	$1,427	$1,427	$1.427	$1,427	$1.259	$1,259	$1,092	$1,092	$1,092	$1,092	5797	$797	$797	$797	$797	$797	$797
	$17,152	S7.891	$7,556--	$7,261	$6,926	$6,631	$6,464	$6,297	-$5.962	$5.962	$5,460	$5,460	$4.997	$4,703	54.575	54.575	54.575	$4,575	$4,240
LFs SUbject to WIP Rep. Only	$5,358	$5,356	$5.022	$4,854	$4.687	$4,687	$4,520	$4.352	$4,352	$4,352	$4,017	$4,017	$3,850	53.683	$3,683	S3,583	$3,583	$3,583	$3.348
LFs.SubJect to Both W1P & Heat Catc. Rep'ting:	$11,795	$2,534	$2,534	$2407	$2239	$1944	$1944	$1.944	$1,610	$1 610.	$1,442	$1,442	$1,147	$1,020	$892	$892	$892	$892	S892
Total by Year:	$17.152	57.891	$7.556	$7,261	$6.926	56,631	$6,464	$6.297	$5,962	$5,962	$5,460	$5,460	$4,997	$4,703	$4,575	$4,575	$4.575	54,575	,54.240

2) Costs for Landfills Subject to Reporting, Monitoring, **and** Control Requ.!rements
(typical businesses; **projected** to have greater than or **equal** to 450,000 tons W1P)

		2010	2011.	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Private LFs	Capital Costs	$0	$288,158	$505,922	$505,922	$505,922	$505,922	$505,922	$505,922	$541,593	$541,593	$541,593	$541.593	$541,593	$541,593	- $541,593	$541,593	$253,435	$35,671	$35,671
	O&MCosts	$0	$684,400	$1,225,800	$1,225,800	$1,225,800	$1,225,800	$1,225,800	$1,225,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	52,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800	$2,195,800
	Monitoring Costs	$2,141,857	$3,077,983	$2,860,346	$2,380,346	$2,380,346	$2,380,346	$2,380,346	$2.517,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2.469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	$2,469,230	52,469,230
	Reporting Costs	$6.247	$3.060	$3.060	$2,805	$2.677	$2.677	$2.677	$2.295	$2,295	$2.295	$2,167	$1,785	$1,657	$1,530	$1,275	$1.275	$1,147	$1,020	$1,020
		$2,148,104	$4.053,602	$4,595,128	$4,114,873	$4,114.745	$4.114,745	$4,114,745	$4,251,247	$5,208,918	$5,208,918	$5,208,790	$5,208.408	$5,208,280	$5,208,153	$5,207,898	$5,207,898	$4,919,612	$4,701,721	$4.701,721
Govt. LFs:	Capital Costs	$0	$483,212	$1,103,346	$1,191,297	$1,191,297	$1,191,297	$1,191,297	$1,191,297	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	$1,279,609	51,279,609	$796,396	$176,263	$88,312
	O&MCosts	$0	$1,192,840	$3,739.780	$3,962,180	$3,962,180	$3,962.180	$3,962,180	$3,962,180	$4,982,180	$4,982,180	$4,982,180	$4,982,180	$4,982.180	$4,982,180	$4,982,180	$4.982,180	$4,982,180	$4,982,180	$4,982,180
	Monitoring Costs	$4,226,595	$5,612,410	$4,600,306	$4,024,306	$4,024,306	$4.024,306	$4,024.306	$4.257,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113,190	$4,113.190	$4,113,190	$4,113,190	54,113,190	$4,113,190	$4,113,190
	Reporting Costs	$12367	$6,884	$6,629	56629	$6120	$5.992	$5865	$5737	$5,610	55482	$5,227	$4 972	$4 717	$4 590	$4 207	$3,952	$3,952	53,825	$3,442
		$4,238,961	$7,295,346	$9,450.061	$9.184,412	$9,183,902	$9,183,775	$9,183,647	$9,416,404	$10,380,588	$10,380,461	$10,380,206	$10,379,951	$10,379,696	$10,379,568	$10,379,186	$10,378,931	$9,895,719	$9,275,458	$9,187,124
Recurring Costs (all)·		56,387,065	$10,577,577	$12,435,921	$11.602,066	$11,601,429	$11,601,302	$11.601,174	$11,970,432	$13,768,305	$13,768,177	$13,767,795	513,767,157	$13,700;775	$13,766,520	$13,765,882	$13,765.627	$13,765,500	$13,765,245	$13,764,862
Annualized Cap. Cost:		*$0*	*$n1,371*	$1,609,268	$1,697,218	$1,697,218	$1,697,218	$1,697,218	$1.697,218	$1,821,202	$1,821.202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,049,831	5211,934	$123,983
Subtotals'	Capital Costs	$0	$771,371	$1,609,268	$1,697,218	$1,697,218	$1,697,218	$1,697,218	$1,697,218	$1,821,202	$1.821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,049,831	$211,934	$123.983
	O&M Costs	$0	51,877,240	$4,965,580	$5,187.980	$5,187.980	$5,187,980·	$5.187,980	$5,187,980	$7,177,980	$7,177,980	$7,177,980	57,177,980	$7,177.980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980
	Monitoring Costs	$6,368,451	$8.690,393	$7,460,652	$6,404,652	$6,404,652	$6,404,652	$6,404,652	$6,774,420	$6,582,420	$6,582,420	$6,582.420	56,582,420	$6,582,420	$6,582,420	$6,582,420	56,582,420	$6,582,420	56,582,420	$6,582.420
	Reporting Costs	$18614	$9,944	$9,6e9	$9,434	$8797	$8669	$8542	$8032	$7,904	$7,777	$7394	$6,757	$6,375	$6,120	$5,482	$5227	$5,100	$4,845	$4,462
Totals·		$6,387,085	$11.348,948	$14,045,189	$13,299,285	$13,298,647	$13,298,520	$13,298,392	$13.667,650	$15,589,506	$15,589,379	$15,588,996	$15.588,359	$15,587,976	$15,587,721	$15,587,084	$15,586,629	$14,815,331	$13,977,179	$13,888,846

3) Reporting costs for AIllandflUs

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Reporting only LFs																			
Private	$2,989	$462	$462	$462	$462	$462	$462	$462	$462	$462	$462	$462	$295	$295	$295	$295	$295	$295	$127
Government:	$14163	$7428	$7,094	$6799	$6,464	56,169	$6002	$5,834	$5,SOO	$5500	$4,997	$4,997	54703	$4408	$4,280	$4,280	$4,280	$4,280	54113·
	$17,152	$7,891	$7,556	$7,261	$6,926	$6,631	$6,464	$6,297	$5,962	$5.962	$5,460	$5,460	$4,997	$4,703	$4,575	54,575	$4,575	$4,575	$4,240
CnUfMonitorlng LFs:																			
Private	$6,247	$3,060	$3,060	$2,805	*$2,6n*	*$2,6n*	$2,677	$2,295	$2,295	$2.295	$2,167	·$1,785	$1,657	$1,530	$1,275	51,275	$1,147	$1,020	$1,020
Government:	$12367	$6,884	$6,629	$6629	$6,120	$5,992	$5,865	$5,737	$5.610	$5482	$5,227	$4,972	$4 717	$4.590	$4.207	$3,952	$3,952	$3,825	$3442
	$18,614	$9,944	59.689	$9.434	$8,797	$8,689	$8,542	58,032	$7,904	$7,777	$7,394	$6,757	$6,375	$6,120	$5,482	$5,227	$5,100	$4,845	$4,462
Total (all):	$35,765	$17,835	$17,245	$16,695	515,723	$15,301	$15,006	$14,328	$13,866	$13,739	$12,854	$12,217	$11,372	$10,822	$10,057	$9,802	$9,675	$9,420	$8,702

4) Total Cost of RegUlation to **Afffected** landfills

Cost Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Capital Costs	$0	$771,371	$1,609,268	$1.697,218	$1,697,218	$1,697,218	$1,697,218	$1,697,218	$1,821.202	$1,821,202	$1,821,202	$1,821.202	$1,821,202	$1,821,202	$1,821,202	$1,821,202	$1,049,831	$211,934	$123,983
O&MCosts	$0	$1,877,240	$4,955.580	$5,187,980	$5,187,980	$5,187,980	$5,187.980	$5.187,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	$7,177,980	*57,1n.980*
Monitoring Costs	$6,368,451	$8.690,393	$7.460,652	$6,404,652	$6,404,652	$6,404,652	$6,404,652	$6,774,420	$6,582,420	$6,582,420	$6,582,420	$6,582.420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420	$6,582,420
Reporting Costs	$18,614	$9944	$9,689	$9,434	$8797	$8,669	$8,542	$8.032	$7,904	$7777	$7,394.	56.757	$8,375	$6.120	$5,482	$5227	55,100	$4,645	$4.462
Annual Totals:	$8.387,065	$11,348,948	$14.045,189	$13,299,285	$13.298,847	$13,298.520	$13,298,392	$13,687,650	$15,589,506	$15,589,379	$15.588,996	$15,588,359	$15,587,976	$15,587,721	$15,587.084	515,586,829	$14,815,331	$13,977,179	$13,888,846
	Lowest Yr,								**Highest** Yr,										

5) **Cost** Per California Household Calculation

Tolal Cost of Prop. Reg. Div. by # of CA Households: $28

CosU CA Household **Div** **by** # of Months in Analysts Period: 0.09 $/monihoLlsehold

231

2029	2030	2031	2032	2033	Total_	
5127	$0	50	50	50	510.098	
53.818	**$3,650**	**$3,850**	**$3,650**	53.021	5129.080	
52.558	52.381	**$2,391**	**$2,391**	**$2,224**	**$87,994**	
5127	**$127**	**$127**	5127	50	**$3,769**	
5335	5335	5335	5335	**$335**	**$12,841**	
50	$0	50	50	50	50	
$797	**$797**	**$797**	**$797**	5462	524.678	
53.845	53.850	53.850	53.650	53.021	**$139,178**	
53.180	**$3,013**	**$3,013**	**$3,013**	**$2,511**	**$95,914**	
$785	**$637**	$837	**$637**	5510	**$43,264**	
53.845	53.850	53.850	**$3,650**	**$3,021**		**$139,178**

2029	2030	2031	2032	2033	Total_	
$35,671	**$3S,671**	**$35,671**	**$35,671**	50	58.123.895	
52.195.800	52.195.800	**$2,195,800**	**$2,195,800**	**$2,195,800**	**$43,172,000**	
$2,469,230	**$2,469,230**	**$2,469,230**	**$2,469.230**	**$2,469,230**	**$59,626,482**	
5892	$892	5765	5765	**$765**	547044	
54.701.584	54.701.584	54.701.488	**$4.701,466**	**$4,665,795**	**$110,969,421**	
$88,312	**$88,312**	**$88.312**	**$88,312**	**$0**	**$19,194,131**	
$4,982,180	**$4,982,180**	**$4,982,180**	**$4,982,180**	**$4,982,180**	**$104,458,400**	
54.113.190	54.113.190	**$4,113.190**	54.113.190	**$4,113.190**	**$100,604,768**	
$3315	**$3.187**	**$3187**	52805	52677	***$121370***	
$9,186,997	**$9,186.869**	**$9,186,869**	**$9.186.487**	**$9,098.047**	**$224,378,669**	
$13,764,607	**$13,764,480**	**$13,764.352**	**$13,763,970**	**$13,763.842**	**$308,030,064**	
5123.983	5123.983	**$123,983**	**$123,983**	50	**$27,318,026**	
$123,983	**$123,983**	**$123,983**	**$123,983**	**$0**	**$27,318,026**	
$7,1n,980	**$7,177,980**	**$7.177.980**	**$7,177.980**	***$7.177,980***	***$147,630,400***	
$6,582.420	**$6,582,420**	**$6.582.420**	**$6,582,420**	**$6,582,420**	**$160,231,250**	
$4.207	**$4,oeo**	**$3,952**	**$3,570**	**$3,442**	**$168,414**	
$13,888,591	**$13,888,463**	**$13,888,336**	**$13,887,953**	**$13,763,842**		**$335348090**
						5335.487.288

2029	2030	2031	2032	2033	Totals	
$127	**$0**	**$0**	**$0**	$O	**510,098**	
$3,818	**$3,650**	**$3,650**	**$3,650**	**$3,021**	**. $129,oeO**	
53.845	53.850	53.650	53.650	53.021		**$139,178**
$892	**$892**	**$765**	**$765**	**$765**	**$47,044**	
$3,315	**$3,187**	**$3187**	**52 805**	**$2 677**	**$121,370**	
$4.207	$4.080	53.952	53.570	53.442		**$168.414**
58.153	57.730	57.803	57.220	**.$6,463**		**$307,593**

$123,983	**$123,983**	**$123,983**	**$123.983**	**$0**	**$27,318,028**	
$7,177.980	**$7,177,980**	**$7,177,980**	**$7,177,980**	**$7.177,980**	**$147,630,400**	
$6,582,420	**$6,582,420**	**$6,582.420**	**$6,582,420**	**$6,582,420**	**$180,231,250**	
_ $4.207	**$4 080**	**$3952**	**$3,570**	**S3442**	**$307.593**	**(incl. reporting only LFs)**
$13,888,591	**$13,888,463**	**$13,888,336**	**$13.887,953**	**$13,763,842**	**$335,487,288**	

TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF COOL CAR STANDARDS AND TEST PROCEDURES - 2012 AND SUBSEQUENT MODEL-YEAR PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES.

The Air Resources Board (ARB or the Board) will conduct a public hearing at the time and place noted below to consider adoption of new regulations to reduce greenhouse gas (GHG) emissions from light-duty and medium-duty vehicles. The proposed regulation would set standards for vehicle window glazing. Solar management glazing will reduce the amount of radiant heat that enters the vehicle, allowing the interior temperature to remain cooler, and reducing the load on the engine from the air conditioner. This will enable the use of a smaller, more efficient air conditioner, which results in lower GHG emissions.

This notice summarizes the proposed regulatory action. The staff report presents the proposed regulation and information supporting the adoption of the regulation in greater detail.

DATE: June 25-26, 2009

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 25,2009, and may continue at 8:30 a.m., June 26,2009. This item may not be considered until June 26, 2009. Please consult the agenda for the meeting, which will be available at least 10 days before June 25, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by fax at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. TTYITDD/Speech to Speech users may dial 711 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected: Proposed adoption of California Code of Regulations, title 17, subarticle 9, new sections 95600, 95601, 95602, 95603, 95604, and 95605.

Background: In 2006, the Legislature passed and Governor Schwarzenegger signed the California Global Warming Solutions Act of 2006, Assembly Bill 32 (AB 32) (Stats. 2006, ch. 488). In AB 32, the Legislature declared that global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The Legislature further declared that global warming will have detrimental effects on some of California's largest industries, including agriculture and tourism, and will increase the strain on electricity supplies. While national and international actions are necessary to fully address the issue of global warming, the Legislature recognized that action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to act.

AB 32 creates a comprehensive, multi-year program to reduce GHG emissions in California, with the overall goal of restoring emissions to 1990 levels by the year 2020. To this end, ARB adopted an AB 32 Scoping Plan on December 12, 2008, which outlines the State's strategy to achieve the 2020 GHG emission reductions.

The "Cool Cars" proposal originally focused on solar reflective paints for automobiles. "Cool Paints for Automobiles" was approved as an Early Action item under AB 32 in June 2007. Glazing was added to the proposal, and the Cool Cars proposal was included in the "Vehicle Efficiency Measure" for light-duty vehicles in the 2008 Scoping Plan. The current Cool Cars proposal includes only the glazing component, and would provide an opportunity for automobile manufacturers to use a less powerful compressor in their air conditioners, as well as reduce the time a driverwould activate his/her vehicle's air conditioner. The use of mobile air conditioners increases greenhouse gas pollutant emissions, as well as emissions of criteria pollutants.

Description of the Proposed Regulatory Action: When a vehicle is parked in the sun, the sun's rays transmit energy into the vehicle through the sheet metal and windows, warming it to levels above ambient temperatures. If some of this energy were blocked or reflected back into the environment, the vehicle's interior temperature would remain cooler, and occupants would be less likely to activate the air conditioner. It would also allow manufacturers to use a smaller air conditioner that would result in fewer GHG emissions while still quickly cooling the vehicle.

The proposed regulation takes advantage of the fact that solar radiation is composed of both visible and invisible light. Slightly over half of the energy from solar radiation is invisible. Solar reflective or solar absorbing glazing can block the sun's invisible energy from entering the vehicle, while maintaining good visibility through the windows.

Staff is proposing that newly manufactured passenger vehicles less than or equal to 10,000 pounds gross vehicle weight use solar management glazing. Beginning with model.-year 2012, windshields would be required to transmit no more than 50 percent of the total solar energy into the vehicle. This includes visible light, as well as ultraviolet and infrared (heat) energy, and would be accomplished using generally available technology. Rooflites that transmit no more than 30'percent of the total solar energy would also be required. The balance of vehicular glazing would be required to transmit no more than 60 percent of the total solar energy.. Most glass manufacturers currently

offer this level of solar control. A second tier requirement for the windshield, limiting total solar transmission to no more than 40 percent, would begin with model-year 2014. Two glazing manufacturers have publicly stated that they have, or will have met or exceeded, this level of control by 2014. Staff is further proposing options wherein manufacturers may trade improved performance in one glazing area for reduced performance in another.

The proposed regulation also requires that automotive glass replaced on vehicles that would be subject to these requirements also comply with applicable transmission requirements. Staff is not proposing that solar management glass be required for vehicles not originally sold with it.

Current automobile glazing has various supplier and safety information on it. The proposed regulation has a placeholder for requiring glazing (new and replacement) to have symbols/icons or other identifiers so that glazing replacers, consumers, and enforcement personnel can readily identify complying product. At the hearing, staff plans to propose specific symbols/icons or other identifiers to further that requirement. Staff may also propose additional changes to the Board at the hearing.

In complying with the proposed regulation, vehicle manufacturers are responsible for ensuring the use of properly labeled glass meeting the required standards, Glazing manufacturers are responsible for providing properly labeled glazing that meets indicated standards, and businesses providing glazing replacement are responsible for ensuring that only properly labeled glazing is utilized. All must keep appropriate records.

This proposal would provide GHG emission reductions throughout California. Staff estimates reductions of almost 0.7 million metric tons of carbon dioxide (MMT C02) per year by 2020 and 1.2 MMT CO_2 per year by 2040 due to reductions in vehicular fuel consumption. The proposed requirements are estimated to result in a per vehicle lifetime cost of about $111, based on anticipated increases in cost for solar management glazing. This cost would be offset over time by fuel savings resulting from reduced mobile air conditioner use, and the potential for a smaller air conditioner. The overall average fuel saving is estimated at 4.4 gallons per year per vehicle. At $3.67 per gallon projected fuel cost, this corresponds to a $16 per year reduction in fuel costs. Thus, the additional cost would have a payback period of around seven years. Criteria pollutants such as oxides of nitrogen and reactive organic gases would also be reduced.

COMPARABLE FEDERAL REGULATIONS

There are no federal regulations comparable to the proposed regulation;

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: Cool Car Standards and Test Procedures - 2012 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

Copies of the ISOR and the full text of the proposed regulatory language may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center,. First Floor, Sacramento, California, 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing on June 25, 2009.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or 'may be accessed on ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Dr. Marijke Bekken, Staff Air Pollution Specialist, at (626) 575-6684, or Ms. Sharon Lemieux, Manager, Emission Research Section, at (626) 575-7067.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Ms. Lori Andreoni, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at www.arb.ca.gov/regact/2009/coolcars09/coolcars09.htm

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a).(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would not create costs or savings to any State agency or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary cost or savings to State or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic' impacts on representative. private persons or businesses. Individuals and state and local agencies may face an increase of approximately one half of one percent in the cost of automobiles purchased. This will be offset by the reduction in fuel use attendant with reduced need for air conditioning and resultant lower GHG emissions.
Other than the small increase in the cost of a new automobile, ARB is not aware of any cost impacts that a representative private. person or business would necessarily incur in reasonable compliance with the proposed action.

The Executive Officer has made an initial determination that the-proposed regulatory action would not have a significant ,statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete witt;, businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action may lead to the creation of jobs within the State of California, but would not affect the creation of new businesses or elimination of existing businesses within the State of California. It may result in the expansion of businesses within the State of California. The proposed regulation could result ina possible increase in research positions to develop any improvements needed in solar management capabilities for window glazing. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR

The Executive Officer has also determined, pursuant to California Code of Regulations, title 1, section 4, that the proposed regulatory action would affect small businesses that supply window replacement services. However, the cost to use specified window glazing will be absorbed by the consumer.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board or that has otherwise been identified and brought to the attention of the Board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may present comments orally or in writing at the meeting, and in writing or by email before the meeting. To be considered by the Board, written comment submissions not physically submitted at the meeting must be received no later than 12:00 noon, June 24,2009, arid addressed to the following:

Postal mail: Clerk of the Board
Air Resources Board
1001 I Street
Sacramento, California 95814

Electronic submittal: http://www.arb.ca.govllispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Gov. Code § 6250 et seq.), written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests but does not require that 30 copies of any written statement be submitted 'and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under that authority granted in Health and Safety Code sections 38501, 38510, 38560, 38562, 38580, 39600, and 39601. This action is proposed to implement, interpret, and make specific Health and Safety Code sections 38501,38505,38510,38550,38551,38560,38562,38580,39003,39500,39600,and 39601

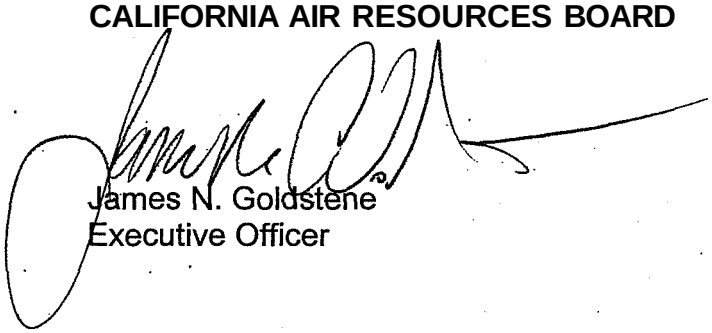
HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action; in such event the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted.

The public may request a copy of **the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.**

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstene
Executive Officer

Date: April 28, **2009**

.The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a *list* of *simple ways you can reduce demand and cut your energy* costs see *our website at www.arb.ca.gov.*

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR RULEMAKING

Cool Car Standards and Test Procedures

Date of Release: May 8, 2009
Scheduled for Consideration: June 25-26,2009

State of California
AIR RESOURCES BOARD

Staff Report: Initial Statement of Reasons for Proposed Rulemaking

PUBLIC HEARING TO CONSIDER THE ADOPTION OF COOL CAR STANDARDS AND TEST PROCEDURES

Date of Release: May 8, 2009
Scheduled for Consideration: June 25-26, 2009

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ARB	Air Resources Board
CO	Carbon Monoxide
CO_2	Carbon Dioxide
C02e	Carbon Dioxide equivalent
FMVSS	Federal Motor Vehicle Safety Standard
GPS	Global Positioning System
GVW	Gross Vehicle Weight
GWP	Global Warming Potential
MMT	Million Metric Tons
LBNL	Lawrence Berkeley National Laboratory
NOx	Oxides of Nitrogen
NREL	National Renewable Energy Laboratory
PET	PolyEthylene Terephthalate
PVB	PolyVinyl Butyral
ROG	Reactive Organic Gases
U.S.	United States

EXECUTIVE SUMMARY

The California Global Warming Solutions Act (Assembly Bill 32) has the goal of reducing California's greenhouse gas emissions. This proposal would contribute to that goal by reducing the load on mobile air conditioners and the percent of time that mobile air conditioners are in use. The use of mobile air conditioners increases greenhouse gas emissions as well as other criteria pollutants.

When 'a vehicle is parked in the sun, the sun's energy travels into the vehicle through the sheet metal and windows, warming it to levels high above ambient temperatures. If some of this energy were to be blocked or reflected back into the environment, the interior temperature would remain cooler. Furher, the air conditioner would not have to work as hard, and would be less likely to be used as often or for as long.

This proposal takes advantage of the fact that solar radiation is composed of both visible light, which determines color, and invisible light. Slightly over half of the energy from the sun is invisible. Solar management glazing (or glass) can block the sun's invisible energy, while maintaining good visibility through the windows. The staff of the Air Resources Board (ARB or Board) proposes to adopt solar management standards for automotive window glazing.

Proposed Requirements

Staff proposes that newly manufactured light- and medium-duty vehicles ,less than or equal to 10,000 pounds .GVW use solar management window glazing that limits the transmission of solar energy into the vehicle. These requirements would reduce the interior temperature of the vehicle. The reduced vehicle temperature would make the driver less likely to turn on the air conditioner and allow manufacturers an opportunity to reduce the size of a vehicle's air conditioning unit. Together, this would reduce the vehicle's greenhouse gas emissions, primarily by reducing fuel use. These proposed requirements would begin with the 2012 model year (first tier). Beginning with the 2014 model year (second tier), more stringent requirements would apply. Replacement windows for affected vehicles would also use solar management glazing. Labeling for the windows (both original and replacement) would also be required.

Solar management automobile glazing is available. Most glazing suppliers will be able to meet the 2012 requirements with existing products, and little new development will be needed. Models sold in Europe such as the Mercedes Benz S-Class and the Ford Focus already offer solar control windshields as part of a comfort option. For the 2014 requirement, one supplier already has a product that will comply with the proposed requirements, and a second has publicly stated that they will have complying product soon. Most suppliers will need to develop and validate a product with greater performance than those currently commercially available for the second tier requirement. Solar management glazing is installed in an identical manner as current glazing.

This proposal would not disproportionately affect environmental justice communities. An earlier version of staff's proposal that aimed to achieve reduced soak temperatures through the use of solar reflective paint and coating systems was supported at the June 2007 Board hearing by the Environmental Justice Advisory Committee.

Environmental and Economic Impacts

This proposal will result in a reduction of greenhouse gas emissions, primarily carbon dioxide (C02), of 0.7 million metric tons per year by 2020 and approximately 1.2 million metric tons per year by 2040. Based on anticipated increases in cost for solar management glazing of $111 per vehicle, and projected savings resulting from reduced fuel use of $16 per vehicle per year, the proposed measure is expected to have a net savings of $348M in 2040. Criteria pollutants such as oxides of nitrogen and reactive organic gases, will also be reduced.

In addition, there exists a potential benefit that ranges from 2.0 to 8.3 million metric tons nationwide if automobile manufacturers elect to use solar management glazing on all their vehicles sold in the United States.

Regulatory Authority

The proposed regulations, as described herein, are consistent with the authority of ARB to control emissions from mobile sources.

Staff Recommendations

ARB staff recommends that the Board adopt the new regulations as set forth in the proposed Regulation Order as Appendix A and as described in this Initial Statement of Reasons.

I. INTRODUCTION

In 2006, California adopted the California Global Warming Solutions Act, Assembly Bill 32. This law created a comprehensive, long term plan for California to reduce greenhouse gas emissions to 1990 levels by 2020. The energy and transportation sectors are the major contributors to greenhouse gases in California. The Air Resources Board (ARB or Board) has previously adopted regulations to address tailpipe greenhouse gas emissions from light-duty vehicles. Staff's proposal, the focus of this staff report, further addresses greenhouse.gas emissions from the light- and medium-duty sectors.

Impact of Vehicular Air Conditioning

The National Renewable Energy Laboratory[1] (NREL) has determined that the United States (U.S.) uses about seven billion gallons of fuel per year for air conditioning in light-duty vehicles. This is equal to about 5.5 percent of the total national light-duty fuel use. In California, NREL projects that 730 million gallons of fuel are used annually for cooling and dehumidification (Rugh et aL, 2004). Running a vehicle's air conditioner increases emissions of criteria and non-criteria pollutants, including carbon monoxide and carbon dioxide ($C0_2$), both considered to be greenhouse gases. Use of the air conditioner can increase fuel consumption on conventional vehicles by more than 20 percent. However, fuel consumption can vary considerably depending on how technically advanced the vehicle's engine is, and its size. In general, for smaller and/or more advanced engines air conditioning usage has more of an impact on fuel consumption.

There are several ways to reduce mobile air conditioner fuel use -- one can make the air conditioner smaller, make it more efficient, or reduce the demand for (use of) air conditioning. Cooling a vehicle down requires a cooling load two to four times greater than that required to maintain a comfortable temperature (steady state load) (Farrington et aL, 2000). The focus of staff's proposal is to reduce the initial cooling load for air conditioning, and the demand for air conditioning, by reducing the vehicle's interior temperature. The proposed measure is an early action item identified in ARB's Greenhouse Gas Scoping Plan, adopted in December 2008.

Reducing Air Conditioner Load and Demand

The interior temperature of a parked vehicle is referred to as the "soak temperature". A black sedan parked in the sun can reach interior temperatures above 180°F (Farrington et aL, 1998). The high temperatures encourage those entering the vehicle, regardless of ambient temperature, to turn on the air conditioner. Once on, the tendency is to continue to use the air conditioner for the entire trip. If the soak temperature can be reduced, some trips that would have used the air conditioner may be completed without its use, thereby reducing fuel use, greenhouse gas emissions,

1 The U.S. Department of Energy's National Renewable Energy Laboratory is the nation's primary laboratory for renewable energy and energy efficiency research and development. NREL's mission and strategy are focused on advancing our nation's energy goals. For more information about this national laboratory, visit http://www.nrel.gov

and the emissions of other criteria pollutants. Reducing heat buildup and/or allowing the hot air in the vehicle to "vent" out to the atmosphere will enable the use of a smaller air conditioner, resulting in initial cost savings for the smaller unit, less refrigerant use to charge and recharge the unit, greater flexibility in where to physically locate the unit, and more efficient use during normal conditions.

" There are a variety of methods to reduce the soak temperature of a vehicle, including paint choices, window glazing approaches, and ventilation.[2] When first envisioned, this regulatory proposal focused on the use of solar reflective paint. As more information became available on the status of technologies that could be used to reduce solar load, the decision was made to expand the scope to include window glazing approaches. With a brief discussion on solar reflective paint, below, the focus of this proposal is only on window glazing technology.

II. SOLAR REFLECTIVE PAINT

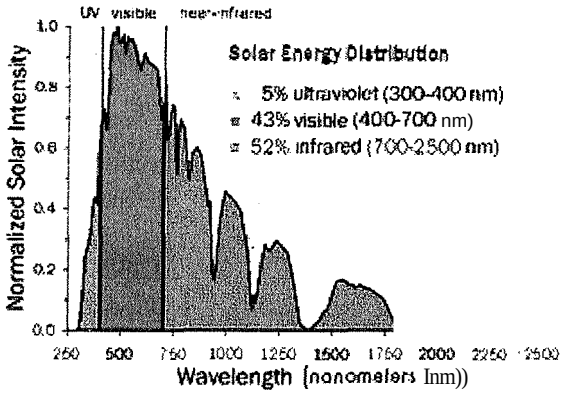
A white vehicle parked in the sun is cooler to the touch than a black one. This is because white is a "reflective" color, while black absorbs light energy. Some" of the additional energy absorbed by the black vehicle is transferred into the vehicle, making the interior of the black vehicle warmer than the interior of the white one. NREL tested two sport utility vehicles, one black and one white." The black vehicle had a reflectivity of about 5 percent, while the white vehicle had a reflectivity of around 50 percent. The exterior skin temperature of the white vehicle was sUbstantially cooler than that of the black vehicle, and the interior air temperature at typical head levels (breath air temperature) was 4.6 degrees C lower (Hoke & Greiner, 2005).

Solar reflective paint formulations take advantage of the fact that the light we see does not account for all of the solar radiation. In fact, as shown in Figure 1, less than half of the solar radiation is in the form of visible light - the balance is infrared and ultraviolet light. The colors we see are those reflected in the visible light range. A white color is seen when most of the visible light is reflected instead of being absorbed, while a black color is seen when the visible light is absorbed and little is reflected. The ideal infrared-reflecting black paint would absorb all ultraviolet light and visible light to provide a deep black color and reflect all infrared light energy. Theoretically, this paint could have a reflectance of over 50 percent (Figure 1). However, there are technical challenges associated with producing such an "ideal" black paint.

Currently, most dark colored paints use carbon black as a pigment. Carbon black is very opaque, and has excellent coverage properties. But carbon black is extremely absorbing of infrared as well as visible light energy. To improve reflectance of dark colored paints, carbon black must be removed or substantially reduced. Staff investigated pigment choices that are currently available or under development to replace carbon black. Unfortunately, while many solar reflective "blackish" pigments

[2] For a discussion of some of these options, staff refers the Rugh & Farrington, 2008.

Figure 1. The Solar Spectrum.



Source: Lawrence Berkeley National Laboratories,' Berkeley, California

are available, none offer the excellent hiding performance or true jet black color that is obtained through the use of carbon black. In addition, these pigments tend to be much more expensive than carbon black. Therefore, although staff believes that solar reflective paint can and should be developed for automotive use, staff was unable to clearly identify a technology path at this time that would lead to improved solar performance with acceptable color choices, costs, and ease of application. Staff believes that this approach should be further considered for a future rulemaking but that it is premature to include solar reflective paint herein.

III. SOLAR CONTROL GLAZING

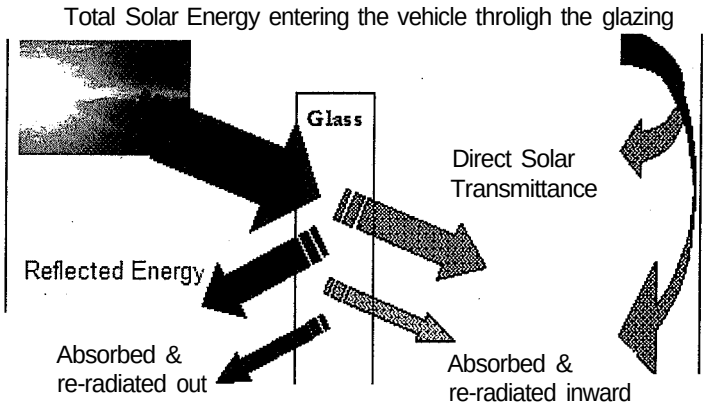
A. Background

Significantly more energy enters the vehicle's interior through the windows than conductively through the paint. When a vehicle is parked, up to 75 percent of the thermal energy entering the passenger compartment is from solar energy transmitted through and/or absorbed and re-radiated by window glazing. Given the trend towards increased use of glass in many vehicles, staff investigated the benefits of glazing provisions for the proposed regulation.

Solar energy enters the vehicle through the glazing via multiple pathways, as shown in Figure 2. First, light energy can pass directly through the glazing. This is referred to as directly transmitted energy. Second, light energy can be absorbed by the glazing. Ultimately, the absorbed energy is either released to the environment or released to the interior of the vehicle.[3] Third, light energy can be reflected off the glazing. This rejected energy does not contribute to solar heat gain inside the vehicle. The glazing can be designed to perform differently for ultraviolet, visible, and infrared energy. With selective solar radiation control, the visible light can be transmitted while the ultraviolet is absorbed and the infrared is reflected.

[3] The exact split depends on a variety of environmental and other conditions.

Figure 2. Solar Energy Pathways.



Depending on vehicle orientation and geometry, 40 to 60 percent of the energy that enters the vehicle through the glazing enters through the windshield. An additional 25 to 30 percent enters through the side windows (Le., sidelites), and 10 to 35 percent enters through the rear window, or backlite. Up to 50 percent more energy can enter the cabin if a sunroof or moonroof (Le., rooflite) is present (Lugara, 2006; Southwall Technologies, 2008).

Staff discussed current and anticipated glazing technology with glass and film suppliers including AGC Automotive (Asahi Glass), Bekaert Specialty Films (Bekaert), Exatec LLC, Guardian Industries Corporation (Guardian), 3M, Pilkington Automotive (Pilkington), Pittsburgh Glass Works (PGW, formerly part of PPG Industries), Saint Gobain Sekurit, Sekisui S-lec, Southwall Technologies (Southwall), and Zeledyne. To a great extent, staff's proposal reflects input received from these discussions, as described below.

B. Current Technology

Current automotive glazing may be tempered or laminated. Each type of glazing has advantages and drawbacks. Tempered glass is less expensive than laminated glass and is easier to produce. It can be drilled and mountings made directly through the glass. In addition, very thin tempered glass can be manufactured. The addition of materials to the molten glass enables automotive tempered glass to be produced that can moderately reduce solar heat gain inside the vehicle. Automotive windshields are required to use laminated glass, because this glass is more difficult to break, and tends to retain its shape and position even when broken. This is because laminates are made by sandwiching a thin layer of polyvinyl butyral (PVB) plastic between two sheets of flat glass. The plastic layer keeps the glass fragments together. The extra processing and the plastic layer mean that laminated glass is generally more expensive than tempered glass. In addition, laminated glass cannot be drilled, so windows must be held in a support frame. Nonetheless, this type of glass offers

improved acoustic performance as well as improved vehicular security, and so is used throughout some mid- and high-end vehicles as part .of a "quiet ride" comfort package. Laminated glass has additional options to reduce solar heat gain because solar management films can be protected between the two layers of glass and solar control products can be applied directly to the interior glass surface(s). This allows a greater degree of solar control with laminated than with tempered glass.

While laminated glass use is required for windshields in the U.S., few of these windshields use optimized solar control. Most'sidelites currently use tempered glass, generally without significant solar control. (Projections provided to staff indicate that about 40 percent of current front sidelites in the U.S. use good solar control, and perhaps a quarter of rearward sidelites and backlite(s) are so equipped.) Some manufacturers have all-around laminated glass in their more expensive models, primarily to reduce noise or as a security measure. There is a trend towards increased use of laminated glass (Pilkington, 2008; PGW, 2009); this regulation could accelerate the trend.

C. Solar Control Products

Solar control glazing or film is available from many manufacturers. Private meetings with glass industry representatives indicate that most suppliers currently offer solar reflective products in the 22 to 35 percent reflectivity range. Most of these products allow no more than 50 percent of the total solar energy into the vehicle, and will meet the proposed 2012 model year requirement for windshields. In Europe, approximately 20 percent of vehicles are equipped with solar reflective windshields. Gtazing with a solar reflectivity of 45 percent has been developed by at least one manufacturer, and other manufacturers are actively working on this level of solar control. This level of control will comply with the proposed 2014 model year windshield requirement. Solar absorbing products are also widely available. These tend to reflect only a small percent of the solar energy (less than 10 percent), but keep half or more of the absorbed energy out of the vehicle. Most suppliers currently have solar absorbing products that allow no more than 60 percent of the total solar energy into the vehicle. This level of control will meet the proposed 2012 model year requirements for the side and rear glazing positions.

Advanced approaches to reduce the solar *energy* entering the passenger compartment through window glazing include making the windows opaque while parked through the use of electrochromic switchable glazing.[4] The advanced approaches can be very effective, but are not yet sufficiently developed for wide-spread commercialization, or are currently prohibitively expensive for most automotive use.

4 This glazing is currently used in the panoramic rooflite of some Ferrari models. In addition, electrochromic mirrors are offered on many vehicle models.

D. Solar Control Glazing Effectiveness

Numerous studies have been conducted in recent years demonstrating the effectiveness of solar control glazing. All-around solar reflective glazing can reduce interior soak temperatures by as much as 10 degrees C, depending on the product and test conditions; more typical results, included in Appendix C, are in the 7-9 degrees C range (see, for example, Rugh et a/., 2007; Lugara, 2006; Farrington, 2000). All-around solar absorbing glazing also reduces interior soak temperatures when compared to standard green tint windows, although not quite as effectively as reflective glazing. Typically, interior soak temperatures with solar reflective glazing are around 2 degrees C cooler than seen with solar absorbing glazing. Because the reflective glazing tends to keep the windows cooler than does glazing that absorbs much of the solar energy, the reflective glazing more effectively minimizes "hot arm syndrome".5 ,

Thus, the better-performing solar reflective glazing should ideally be used throughout the vehicle.

However, requiring solar reflective glazing throughout the vehicle would typically necessitate the use of laminated glass rather than the tempered glass more commonly found in the sidelites andbacklitesof U.S. cars. A switch'to laminated glass would involve an additional expense. Discussions with manufacturers indicate that if a typical piece of sidelite glass currently costs the manufacturer around $7, a laminated replacement piece might cost slightly over $20. This is a 3-fold increase in cost, before any solar control is added. This cost difference is relatively large' for the benefit to be obtained in locations where laminated glass is not currently used. Therefore, staffs proposal sets a "total solar transmission limit,,6 for the different glazing locations rather than specify the use of solar reflective glazing.

IV. OTHER APPROACHES

Insulation: Insulation is used in many areas of the vehicle, though the focus has been more on noise reduction than temperature regulation. The benefit of headliner insulation depends on exterior surfaces and interior temperatures. If the interior is substantially warmer than the exterior, increasing the insulation in the headliner may actually make the car warmer. The decision to utilize additional insulation requires system-based considerations.

5 "Hot arm syndrome" refers to the increased thermal sensation on a vehicle occupant's arm due to the solar energy that passes through the glass into the vehicle. This generally causes discomfort and can lead to air conditioner use even where the average interior temperature is not uncomfortably warm.

6 "Total solar transmission" or "Tts" is a measure of the amount of solar energy that passes through the glazing (including energy absorbed and subsequently re-radiated to the interior) compared to all the solar energy falling on the glazing. It is usually expressed as a percent. The total solar transmission limit is the maximum amount allowed for a particular model year in each glazing position under ,this proposed regulation,

Cool Materials: Upholstery that reflects instead of absorbs the short-wave radiation leaves it in the short-wave form, which can pass back out through the windows. Solar reflective materials on seats, dash (especially the steering wheel), and arm rests also can make the vehicle seem more comfortable even when at a higher temperature. Such materials are available.[7] Thermoregulating materials are also being developed, such as phase change materials (see, for example, Pause, 2002) that absorb soaked heat and release it slowly during vehicle operation when the air conditioner system can easily accommodate it.

Ventilation: Parked-car ventilation can effectively remove accumulated heat. A small fan, powered by a photovoltaic cell, can exchange interior air with exterior air. Such ventilation systems are present on at least two European models (Friedrich, 2007). An even simpler approach, leaving the sidelites open 2 cm can reduce cabin air temperatures (Rugh & Farrinton, 2008).

Delivery Methods: Improving the delivery methods for conditioned air is another effective way to increase thermal comfort at little energy cost. The better the cool air is directed at the occupant(s)l the less is needed to achieve comfort. When efficient delivery methods result in equivalent thermal comfort at higher cabin temperatures, the air conditioner load is reduced, and greenhouse gas emission reductions are achieved.

Due to insufficient data, staff's proposal would not require any of these approaches. However, staff believes that these should be considered and pursued by manufacturers, as should solar reflective paints. Indeed, these technologies could be part of future regulatory efforts to reduce mobile air conditioning use.

V. OTHER VEHICLE CLASSES

Many of these thermal load reductions and improved comfort technologies can be applied to larger medium- and heavy-duty vehicles. Despite ARB's existing idling-restriction rules for heavy-duty trucks, many truckers may leave their vehicle running to provide air conditioning during brief rest periods or when goods are being loaded and unloaded. Reducing the heat gain during these periods might enable the cabin to remain sufficiently cool so as to not require air conditioning. Again, due to insufficient data, staff's proposal does not apply to vehicles over 10,000 pounds GVW. But these vehicles could also benefit from the proposed requirements. Staff intends to further evaluate this issue.

VI. THE REGULATORY PROPOSAL

This measure would reduce the need for air conditioning during times of moderate ambient temperature and/or short soak periods, and would allow manufacturers to downsize the air conditionerfor year-round emissions improvements.

[7] See, for example, www.ips-innovations.com/automotiveapplications.htm

A. The Regulatory Proposal

Staff recommends that the Board adopt a new Subarticle 9, sections 95600 to 95605, to title 17, California Code of Regulations, as set forth in, Appendix A. All the provisions in the proposed regulation would apply to passenger vehicles less than or equal to 10,000 pounds GVW ("passenger vehicles") produced for sale in California.

Staff is propos.ing that newly manufactured passenger vehicles use solar management glazing. Beginning with model-year 2012, windshields would be required to transmit no more than 50 percent of the total solar energy into the vehicle. This includes visible light, as well as ultraviolet and infrared (heat) energy, and would be accomplished using generally available technology. Rooflites that transmit no more than 30 percent of the total solar energy would also be required. The balance of vehicular glazing would be required to transmit no more than 60 percent of the total solar energy. Most glass manufacturers currently offer this level of solar control. A second tier requirement for the windshield, limiting total solar transmission to no more than 40 percent, would begin with model-year 2014. Two glazing manufacturers have publicly stated that they have or will have met or exceeded this level of control by 2014. Staff is further proposing options wherein manufacturers may trade improved performance in one glaZing area for reduced performance in another.

The proposed regulation also requires that automotive glass replaced on vehicles that would be subject to these requirements also comply with transmission requirements.

Current automobile glazing has various supplier and safety information on it. The' proposed regulation also requires that automotive glazing (new and replacement) must have symbols/icons or other identifiers so that glazing replacers, consumers, and enforcement personnel can readily identify complying product. Staff plans to provide examples of such identifiers to the Board at the hearing.

Staff also recommends that manufacturers consider the use of additional techniques to reduce air conditioner load such as active or passive parked-car ventilation; solar reflective paint and coating systems; active or passive climate-control seating; maximally efficient air conditioner components; increased use of recirculated air,[8] where appropriate; and elimination of overcooling and subsequent reheating of air that may occur to achieve the desired temperature in vehicles with automatic temperature control systems.

B. Regulatory Alternatives

Various regulatory alternatives have been considered, summarized in Table 1, but were rejected by staff. As shown, each of the alternatives has an associated emissions benefit. Discussion of how these benefits are calculated is included in Appendix B.

[8] Staff notes that when activating the air conditioner of a vehicle, the interior of which is hotter than ambient, it would be most efficient if the system automatically drew in the cooler air until equilibrium is reached.

Requiring solar management glazing at the 60% total solar transmission level throughout the vehicle would result in the equivalent of 0.85 MMT CO_2 reduced per year with full implementation. Setting an all-around 50% total solar transmission level would result in the reduction of 1.18 MMT CO_2 per year in 2040. The most benefit would be achieved if all-around solar management glazing with a maximum total

. Table 1. Regulatory Alternatives

Alternative	Reductions
Tts of 60%, all-around	0.85 MMT C02 per year
Tts of 50%, all-around	1.03 MMT C02 per year
Tts of 40%, all-around	1.34 MMT C02 per year
Performance Standard	1.18 MMT C02 per year
Staff's Proposal	Reductions
Tts of 40% for windshield; specified requirement for other glazing	1.18 MMT C02 per year

solar transmission of 40 percent were required. However, with current and anticipated technological approaches, such a level of control would also·require al/-around laminated glazing, at a substantially increased cost.

A performance standard alternative could set a target for air conditioner-associated greenhouse gas emissions, a soak temperature reduction target, a maximum solar load target, or some other metric that is ultimately associated with reduced air conditioner emissions. The reduction goal could be met by a combination of the use of solar reflective paint, solar management window glazing, passive or active ventilation, insulation modifications, seat ventilation, or other technological approaches to reduce interior soak temperatures, or by improvements to the delivery of cooled air. Although a general requirement to reduce the soak temperature by a given percentage or given number of degrees would provide flexibility, compliance would be more complex, as the geometry and specific design of each vehicle will affect the reductions obtained, and crafting the requirement in such a way would require extensive testing or modeling of vehicle body and interior packages. In addition, enforcement could be very difficult. .

Staff's proposal, applying the most stringent requirement to the windshield and rooflite only, and a lesser requirement to other glazing, will result in a benefit of 1.18 MMT C02 per year in 2040.

Having considered these alternatives, staff concludes that the proposed requirements most effectively and efficiently achieve the desired reductions in greenhouse gas emissions.

C. Regulatory Authority

The proposed regulations, as described herein, are consistent with the authority of the ARB to control emissions from mobile sources. Specific authority cited in the proposed regulatory language includes Health and Safety Code sections 38501, 38510, 38560, and 38562, 39600, and 39601.

D. Outreach Efforts

ARB strives to involve the widest number of affected persons in the development of its regulations. For this rule, staff conducted two public workshops and numerous additional focused meetings. Notices for the workshops, held on May 15, 2008, and March 12, 2009, were posted to ARB's website and emailed to subscribers of ARB's electronic list server. The workshops were held in El Monte, California, and conference lines were available for individuals who could not travel to the meeting location. Approximately 40 people attended each workshop; many additional people attended by teleconference. To generate additional public participation and to enhance the information flow between ARB and interested persons, staff made all documents, including workshop presentations, available via the website. In addition, the website serves as a portal to other websites with related information.

Staff also attended the National Glass Assoc!ation's annual conference in Orlando, Florida and gave a presentation on the proposed regulation to the attendees on February 19, 2009. The primary purpose for staff's participation in the conference was to find out what impact the rule would have on the automobile replacement glass industry. Attendance at the conference served as an opportunity to interact with presidents/owners of automobile glass retail shops, adhesive suppliers, and executives from the top glazing suppliers in the world.

In addition to the workshops and conference noted above, staff participated in individual meetings in person or via telephone with glass and window film suppliers including Asahi Glass, Bekaert, Exatec, Guardian, 3M, Pilkington, PGW, Saint Gobain, Sekisui, Southwall, and Zeledyne, as well as Chinese glass suppliers (via email). Staff also met with many vehicle manufacturers individually and in group meetings organized by the Alliance of Automobile Manufacturers. At these meetings, current and future anticipated technology, research needs, regulatory alternatives, and other issues were discussed. Suggested alternatives were explored by staff, and were incorporated where appropriate. Numerous informal telephone and email communications also occurred with these and other interested parties including environmental organizations and research institutions.

E. Implementation Barriers

The primary implementation barrier for solar management glazing is one of increased cost. If consumers were to demand better climate control along with lower fuel use, automobile manufacturers would have a financial incentive to incorporate these technologies absent regulation. But most consumers do not know the technologies exist.. Surveys indicate that most consumers, when informed of the benefits of these

technologies, show interest in purchasing them, and, in general, are willing to pay more than their current retail cost (see, for example, Harris Interactive, 2007).

Manufacturers have expressed some concern about the potential for solar reflective glazing to interfere with reception for sensors and devices such as cellular telephones and global positioning systems (GPS). However, deletion windows[9] can be used to ensure good reception, and provisions for deletion windows are included in the proposed regulation. The issue has been successfully addressed in Europe, where many vehicles use solar reflective windshields, and some models currently offer solar reflective glazing in all window locations. Staff further believes that reception should not be a major issue since reflective glazing is not required in all glazing positions in the proposed regulation.

VII. ENVIRONMENTAL AND ECONOMIC IMPACTS

A. Benefits

The calculated emission benefit is based on a likely reduction in soak temperature of around 7 degrees C, depending on vehicle type. Staff applied the reduced interior temperatures to the work demand for the air conditioner compressor, following the methodology presented in Appendix B. The lower compressor demand[12] will lead to

9 Deletion windows are areas on a vehicle's glazing specifically designed to facilitate transmission of electromagnetic signals into and out of the vehicle.

10 AB 1493 (Pavley) directs ARB to adopt regulations to achieve the maximum feasible and cost-effective reduction of greenhouse gas emissions from motor vehicles.

11 Staff directs the reader to the Staff Report for the AB 1493 regulation (ARB, 2004), specifically the discussion surrounding Table 5.1-12 (page 75).

12 Air conditioner systems for vehicles are typically sized to achieve cool-down of a black vehicle parked for four hours in the Phoenix summer sun to a comfortable temperature in a set amount of

reduced greenhouse gas emissions of 0.86 MMT per year in 2040. In addition to these benefits, the cooler interior temperature is anticipated to result in reduced use of the air conditioner during periods of mild temperatures and/or short soak. Using the methodology described in Appendix B, staff estimated that an additional 0.29 MMT CO_2 reduction would be achieved during these times. Another 0.03 MMT benefit is estimated for vehicles that have left California.

There are other non-quantified benefits. The ability of the manufacturers to utilize a less powerful air conditioner will have associated non-quantified benefits: A smaller unit would be charged with a smaller volume of refrigerant, so less refrigerant would be released throughout the vehicle's life and in a leak-situation, further reducing greenhouse gas emissions. A smaller unit would also be lighter and easier to physically locate within the engine compartment. In addition, a smaller unit would be less expensive.

In 2040 (near full implementation), staff estimates that the proposed requirements would result in a reduction of 1.18 MMT CO_2 per year. In 2020, approximately 0.68 MMT CO_2 would be reduced. In addition, emissions of other criteria pollutants such as oxides of nitrogen (NOx), and reactive organic gases (ROG) would also be reduced. Based on the cost differential for solar management glazing, discussed in the next section, staff believes it probable that manufacturers will opt to utilize solar management glazing in the sidelites and backlites nationwide, and may even choose to use the high-performance windshields in all vehicles as well. If so, additional 2040 benefits of 1.96 to 8.30 MMT CO_2 per year are anticipated. Quantified emission benefits are summarized in Table 2, and their derivation explained in Appendix B. With full implementation, this measure is expected to save 161.5 million gallons of fuel per year statewide.

Table 2. Projected Emission Benefits.

	CO_2 (Calif.) (MMT per yr)	CO_2 (U.S.)* (MMT per yr)	CO (tons/year)	NOx (tons/year)	ROG (tons/year)
2020	0.68	1.13-4.78	7,659	179	64
2040	1.18	1.96 - 8.30	12,696	297	106

* Potential U.S. benefits assume that automakers choose to use solar management glazing throughout the U.S.

B. Costs

The direct cost of this measure is the increased cost of a vehicle equipped with solar management glazing, plus any increase in window replacement costs over the vehicle life. The cost savings are primarily reduced fuel purchases. The increase in the cost of the vehicle would be a one-time capital cost paid by the co'nsum'er. The reduced fuel purchases would be realized over the life of the vehicle.

time. If the interior is less hot, the desired temperature goal will be achieved more quickly; therefore, to attain the same overall air conditioner performance, a smaller (lower kilowatt) air conditioner can be used.

1. Solar Management Glazing Costs

Current glazing ranges from clear glass (Le., no solar control) for inexpensive vehicles to all-around solar reflective glazing on more expensive European models. The proposed regulation does not require the use of solar reflective glazing. However, to meet the proposed windshield requirements with currenttechnology, a solar reflective approach is likely. While solar reflective glazing generally requires the use of laminated glass, all windshields currently use laminated glass. Thus, the cost for a solar reflective windshield would only reflect the additional cost of the film or coating. For the balance of glazing, the cost will be the cost to move from the current level of solar control (none, light green tinting, solar absorbing glazing) to a glazing that transmits no more than 60 percent of the total solar energy.

In its cost estimates, staff has considered anticipated cost increases suggested by both glazing and vehicle manufacturers. For the first tier (2012) windshield requirement, direct cost estimates provided to staff range from $15 to $110 over current glazing, with the typical estimated direct cost of around $35. Staff used the typical 'cost of $35 for our analyses.[13] For the second tier (2014), anticipated cost increases provided by glazing manufacturers indicate an additional $10 to $15 would be expected, for a total increased direct cost from today's baseline cost of up to $50 for the windshield. Depending on current control levels, cost increases for the other glazing ranges from $0 to $33, with an ,anticipated average cost of $18 per vehicle (see Appendix C). This results in a total direct cost to the vehicle manufacturer for the tier 2 (2014) requirements of $68 ($50+$18). Derivation of this average can be found in Appendix C.

The $68 estimated direct cost increase for the solar management glazing reflects the cost that the glass suppliers 'charge the automobile manufacturers. But there are also indirect costs that the automobile manufacturers may encounter. The automotive industry applies scaling factors to predict the full impact vehicle modifications have on the selling price. A commonly used scaling factor is the retail price equivalent (RPE) multiplier. This RPE multiplier includes both direct and indirect costs. In a recent EPA report (EPA, 2009), an indirect cost multiplier was developed which specifically evaluates the components of indirect costs likely to be affected by vehicle modifications associated with environmental regulation. A range of multipliers accounts for the differences in the technical complexity of the change, and adjusts over time as new technology becomes assimilated into the. automotive production process. The underlying concept is that regulations requiring major changes in materials or manufacturing processes, or significant invention of new' technology, will likely have a significant impact on indirect costs. In contrast, regulations requiring simple technology modifications may have negligible impacts on indirect costs.

13 The estimated cost includes the costs for "deletion areas" in reflective coated windshields to allow the proper operation of electronic devices such as cellular telephones and global positioning systems.

Staff believes that the sidelite, backlite, and rooflite requirements in this regulation are low complexity changes. Staff anticipates that they will introduce only minor changes to existing glazing. However, if compliance with the windshield requirements leads to the use of metallic materials that result in electromagnetic attenuation, other associated components might need to be addressed, such as the positioning of antennae and the creation of deletion areas. Therefore, staff proposes a medium complexity multiplier for the windshield, and a low technology multiplier for the balance of glazing. The low complexity multiplier suggested in the EPA analysis is 1.05 in the short term, and 1.02 in the long term. The medium complexity multiplier suggested in the EPA analysis is 1.2 and 1.05. Applying these multipliers would increase the long-term cost assessment for compliant glazing at the tier 2 (2014) level to $52.50 for the windshield, and $18.36 for the balance of glazing, for a total adjusted cost to the consumer of around $71. These cost estimates are summarized in Table 3. Further cost details can be found in Appendix C.

These projected costs to the consumer of up to $71 could be offset by savin'gs to the manufacturer due to potential downsizing of the air conditioner, and the balance, if any, can be passed on to the consumer.

Table 3 Cost Estimates.

	Windshield		Other Glazing	
	Direct	Total	Direct	Total
First Tier	$35	$42 (short-term)	$18	$18.90 (short-term)
Second Tier	$50	$52.50 (long-term)	n/a	$18.36 (long-term)
Subtotals (long-term)		$52.50		$18.36
Total			$71	

2. Potential cost to individuals and local/state agencies

Assuming the automobile manufacturers opt to pass on any increased cost for the window glazing to the consumer, individuals and state and local agencies would face an increase of less than one half of one percent in the price of an average vehicle priced at $20,000. If the purchased vehicle is financed at a rate of five percent, the monthly payment would increase by $1.34, and the total interest paid over the life of the loan would increase by $9.39.

Some costs may also be incurred during vehicle ownership. Data indicate that the typical windshield needs to be replaced after an average of 8 years due to damage, and is therefore replaced once during the vehicle's typical useful life. The cost of the windshield to the re-glazer would be increased by up to $50. Using typical mark-up rates, staff determined an out-of-pocket increased expense for the un-insured consumer of $150. Staff also assumed the replacement of one sidelite due to breakage at an average increased cost of $2, corresponding to an increased expense of no more than $6.

Approximately 80 percent of glazing replacements are covered by insurance. Staff contacted several insurance carriers to determine likely pr.emium increases due to the

use of solar management glazing. Since the use of this glazing would result in increased cost to the insurance company when glazing replacements covered by' insurance were made, it seems reasonable that premium increases could result. The carriers staff contacted uniformly agreed that there would be no premium increase resulting from windows with an increased replacement cost of around $150. Staff also queried on-line, providers for custom cars. Using the average new car sales price, and entering "modifications" that increased the car's value up to $500 did not change the quoted premium.[14] Various blogs indicated that there is no change in insurance premiums based on the number of window replacement claims. These claims are apparently a very minor part of the financial outlay for an insurance company, and do not merit special attention. Staff concludes that there will be little or no cost impact for insurance premiums as a result of this proposed regulation.

Therefore, staff multiplied the $156 by the approximately 20% of such window replacements that are not covered by insurance,15 to generate an average window replacement cost to the consumer of $31 over the life of the vehicle. Thus, the total cost to an individual over the life of the vehicle is assumed to be $71 (increased purchase cost) plus $9 (increased finance cost) plus $31 (increased replacement glazing cost), for an average total lifetime cost of $111 per vehicle. Amortized over the expected useful life of the air conditioner system, typically 12 years, generates an annualized cost to the consumer of $9.25 per year.

These increased costs would be offset by the reduction in fuel use attendant with reduced need for air conditioning. Based on the projections discussed above and in Appendix B, consumers will save an estimated $16 per vehicle .per year in fuel costs. This results in a payback period of around seven years, after which savings will accrue until the vehicle is retired.

3. Administrative Costs

In addition to the costs to supply the glazing, there could be some administrative costs. Glazing suppliers not currently determining the solar performance of their products would need to begin doing so. This likely applies only to low-end suppliers. Once the test procedures are in place, the costs of such tests will be very modest, and will be borne by the suppliers and subsumed within the cost of the product. Records are already retained by vehicle manufacturers, and no additional manufacturer record keeping cost is anticipated.

ARB could also incur costs to implement and enforce the proposed regulation. ARB's certification section indicated that no additional costs would be incurred to review the additional submittal. However, there may be a small cost to the State to increase ARB's staff to enforce the rule.'

14 See, for example, www.lelandwest.com.

15 Eighty percent of window replacements are made under insurance, which will cover solar management materials. Consumers would bear increased replacement costs for the balance of window replacements.

C. Cost-Benefit Assessment

In 2040, anticipated costs are assessed based on the number of affected 2040 model-year vehicles (estimated by EMFAC at around 2.2 million vehicles) times $111 per vehicle, or $244.5M and benefits will be 1.18 MMT C02. The measure will reduce fuel consumption by 161.5 million gallons per year in 2040. At $3.67 per gallon (CEC, 2007), this corresponds to an annual economic savings of over $592.8M. Thus, the proposal results in a net savings of $372.3M per year; or a savings of $295 per metric ton C02 reduced.

D. Affected businesses

Any business involved in the production or furnishing of automotive glazing could be affected by the proposed regulation. This includes automobile manufacturers, window suppliers, and the re-glazing industry. Manufacturers and glazing suppliers are generally located outside of California. Southwall, Bekaert, and Applied Materials are the only California-based companies of which staff is aware that are producing solar management glazing products. Therefore most impacts to these businesses, both positive and negative, will occur in other states.

This regulation would be expected to have a minimal impact on small business. Small businesses affected by the proposal include most of the window replacement facilities, as well as Southwall and Bekaert. A search of on-line data[16] indicates that there are 1,021 automotive window replacement businesses in California. In addition to these, however, vehicle dealerships are also called upon to replace glass. A similar search indicates there are 2,081 new vehicle dealerships in California. These window replacement businesses, whether small or large, independent or affiliated with a vehicle dealership, will need to use replacement windows that meet the specified performance. The additional cost, if any, for the solar management glazing will be passed on to the insurance company or to the consumer. Solar management windows are expected to be replaced in exactly the same manner as current windows; no additional steps need be taken. No record keeping requirements beyond what needs to be done for current inventory needs are anticipated.

Window glazing and film producers will see an increased interest in their solar management glazing products. Total sales of window glass are not expected to change. However, market shifts may occur, so individual businesses may grow or shrink. It is anticipated that Southwall, a California-based small business producing window film, could see an increase in demand for its films, resulting in the additional employment of perhaps a dozen people, and the potential to re-open its manufacturing facility in California. It is expected that personnel and sales at Bekaert and Applied Materials, also California companies, could see a similar benefit, although the exact increase is not known.

Staff believes that two U.S.-based glazing manufacturers are poised to increase market share with this regulation, due to indications that they are further along in the

[16] See www.labormarketinfo.edd.ca.gov.

development of compliant product. These businesses, and any others in a similar situation, may see growth in employees and production. This growth, however, would be offset by reductions in market share for those not so positioned, since the total number of vehicles sold is not expected to change as a result of these proposed regulations. Thus, on a nationwide basis, staff believes that there would be no significant business creation or elimination, although market shifts may occur. However, most window glazing companies will need to improve the solar performance of their product line. To the extent that those businesses or research facilities are located in California, the proposed regulations could lead to the expansion of businesses in California.

Staff believes that there would be no effect on automobile business competitiveness, as all manufacturers selling vehicles in California would need to comply with the proposed regulation. Staff is not aware of any major automobile companies doing business in the U.S. that do not sell vehicles in California.

E. Potential Negative Impacts/Outstanding Issues

Industry raised concerns about potential interference of electromagnetic signals used in sensors and other devices with the use of solar reflective glazing. Staff believes that this issue should be minimized by limiting likely use of this type of glazing to the windshield. Some manufacturers have also expressed the opinion that staff's cost estimates are too low. Staff has received input on costs from both vehicle and glazing manufacturers, and believes its cost estimates to be reasonable.

A concern was raised about the use of the proposed test procedure, primarily relating to the fixed convective coefficients and secondary heat generation from absorption, and their relationship to calculations of total solar energy transmitted (discussed in more detail in Appendix C). An alternate methodology was considered, but the consensus among glass manufacturers whom staff contacted was that the increased accuracy of the alternate method was not worth the complications it would introduce into the calculations of total solar energy transmitted. However, the proposed regulations allow use of an alternative test methodology with Executive Officer prior approval. Manufacturers would have to demonstrate via real-world vehicle testing that the proposed alternative test methodology results in equivalent solar control (Le., vehicle temperature reduction).

ARB was asked to consider exempting vehicles without air conditioners from these regulations. Currently, approximately 98 percent of passenger cars sold in California are equipped with air conditioning, and about 95 percent of trucks are so equipped. Staff opted for no exemption, because of concerns about aftermarket addition of air conditioning, practicalities of manufacturing and enforcement, and because staff believes there will be an emissions benefit even for vehicles without air conditioners in that if the interior temperature is less hot, the occupant will be less likely to keep the windows down, and therefore the vehicle will be operated in a more aerodynamic manner. Staff believes that the increase in cost will be acceptable to the consumer for the benefit of cooler interiors. Staff was also asked to consider exempting

convertibles from the proposed regulation. Staff is continuing to investigate this issue.

Staff was recently asked to consider exempting non-glass materials such as polycarbonates (Le., plastic windows) from the proposed requirements. Staff believes that these materials can and should include solar management technologies. Therefore, staff does not believe an exemption is warranted at this time based upon current available information.

VIII. ENVIRONMENTAL JUSTICE

"Environmental Justice" is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Government Code §65040.12(c». The policies apply to all communities in California but environmental justice issues have been raised more in the context of low-income and minority communities, which sometimes experience higher exposures to some pollutants as a result of the cumulative impacts of air pollution from multiple mobile, commercial, industrial, area-wide, and other sources. Climate change could disproportionately affect low-income communities due to the potential for increased temperatures and other adverse weather phenomema, as well as potential effects on temperature-related issues such as food production and thence, food prices.

Staff believes that this proposal will have minimal adverse environmental justice impacts. The proposal will have only a small impact on the price of a new car (around one half of one percent). The cost increase for the solar management glazing will be offset by reduced fuel use, potentially smaller air conditioner systems, and reduced cost for system recharge due to the smaller size. The original proposal, which proposed the use of solar reflective paint to reduce interior soak temperatures, was reviewed and approved by the Environmental Justice committee. While this revised proposal has somewhat greater costs than the original proposal, its effects on environmental justice communities should not be significantly changed.

IX. REQUIREMENTS OF AS 32

AB 32, at Health and Safety Code section 38562, requires that ARB adopt regulations by January 1,2010, to implement discrete early action GHG emission reduction measures. These measures must "achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions" from the sources identified for early action measures. AB 32 contains additional standards in Health and Safety Code section 38562 that apply to regulations that will be adopted for general emissions reductions consistent with ARB's scoping plan. In addition, AB 32 requires that the reductions be real, permanent, quantifiable, verifiable, and enforceable. Furthermore, section 38565 requires the Board to "ensure that the greenhouse gas emission reduction rules, regulations, programs, mechani'sms, and incentives under its jurisdiction, where applicable and to the extent feasible, direct public and private investment toward the most disadvantaged communities in Calif.ornia and provide an opportunity for small business, schools, affordable housing

associations, and other community institutions to participate in and benefit from statewide efforts to reduce greenhouse gas emissions." Staff believes that the cool cars program was developed in accordance with the requirements of AB 32 and has outlined the requirements set forth in sections 38562 and 38565 below.

A. Section 38562

1. Design the regulations, including distribution of emissions allowances where appropriate, in a manner that is equitable, seeks to minimize costs and maximize the total benefits to California, and encourages early action to reduce greenhouse gas emissions.

The proposed regulation utilizes window glazing technology that is believed to be readily achievable in the allotted timeframe in order to maximize benefits and minimize costs. See Sections III (Solar Reflective Glazing) and VII (Environmental and Economic Impacts) for a detailed discussion.

2. Ensure that activities undertaken to comply with the regulations do not disproportionately impact low-income communities.

Passenger vehicles operate throughout California; no disproportionate localized impacts are expected. See Section VIII (Environmental Justice).

3. Ensure that entities that have voluntarily reduced their greenhouse gas emissions prior to the implementation of this section receive appropriate credit for early voluntary reductions.

This requirement is not applicable to the proposed regulation.

4. Ensure that activities undertaken pursuant to the regulations complement, and do not interfere with, efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminant emissions.

The proposed regulation would support ARB's efforts to achieve federal and State standards for criteria pollutants. Vehicles with solar management glazing will consume less fuel and emit fewer greenhouse gases when operating the air conditioner. There are also reductions in criteria pollutants associated with the decreased consumption of fuel. See Section VII (Environmental and Economic Impacts).

5. Consider cost effectiveness of these regulations.

The proposed regulation is expected to result in a net benefit for Californians by reducing fuel consumption and reducing emissions. See Section VII (Environmental and Economic Impacts).

6. Consider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy environment and public health.

The proposed regulation for cool cars is expected to achieve multiple benefits to society and the environment. California would benefit from the reduction of GHG and criteria pollutant emissions that result from vehicles using less fuel for mobile air conditioning. The regulation would also allow the use of smaller air conditioners, containing a lower volume of refrigerants. See Section VII (Environmental and Economic Impacts).

7. Minimize the administrative burden of implementing and complying with these regulations.

The administrative burden of the proposed regulation is expected to be minimal. The proposed regulation requires information to be included in the vehicle owner's manual as to the performance of the glazing utilized in the vehicle. The regulation will require that vehicle manufacturers maintain records of the performance of the glazing utilized in vehicles to be sold in California, and glass replacement facilities to maintain records of glazing installed. See Section VI (Regulatory Proposal).

8. Minimize leakage.

Leakage occurs when an emission limit or regulatory requirement set by the State causes business activities to be displaced outside of California. If leakage were to occur, emissions, jobs and other economic benefits to California would be lost. Leakage is not expected as a result of the proposed regulation.

9. Consider the significance of the contribution of each source or category of sources to statewide emissions of greenhouse gases.

The transportation sector is the largest contributor to the total statewide GHG emissions inventory, producing approximately 38 percent of the state's total GHGs or 179 MMT COze. Emissions from the transportation sector must be significantly reduced in order to achieve 1990 GHG levels by the year 2020. This proposed regulation will reduce the contribution to greenhouse gases from the transportation sector.

The statewide GHG emission benefits of the proposed regulation are projected to be 0.68 MMT CO_Z per year in 2020, increasing to 1.18 MMT CO_Z in 2040. See Section VII (Environmental and Economic Impacts).

B. Section 38565

1. Direct public and private investment toward the most disadvantaged communities in California.

No public investment is anticipated; private investment would occur at already-located facilities for Southwall, Bekaert, and Applied Materials.

2. Provide an opportunity for small business, schools, affordable housing associations, and other community institutions to participate in and benefit from statewide efforts to reduce greenhouse gas emissions.

This proposed regulation will result in all motor vehicles less than or equal to 10,000 pounds GVW using solar management glazing beginning with the 2012 model year. Comfort will be improved for drivers and passengers in these vehicles, and fuel consumption will be reduced.

·X. STAFF RECOMMENDATIONS

Staff recommends that the Board adopt, on the basis of the reasons presented, the proposal as set forth within this staff report, and as specifically described in Appendix A.

XI. REFERENCES

ARB (Air Resources Board). 2004. Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles. August 6,2004.

CEC (California Energy Commission). 2007. Transportation Energy Forecasts for the 2007 Integrated Energy Policy Report. Final Staff Report. CEC-600-2007-009-SF September 2007

EPA. 2009. Automobile Industry Retail Price Equivalent and Indirect Cost Multipliers. Prepared by Alex Rogozhin & Michael Hallager, RTI international, and Walter McManus, Transportation Research Institute, University of Michigan, RTI Project Nu 0211577.002.004 EPA report EPA-420-R-09-003 February 2009.

Farrington, Ret al. Opportunities to Reduce Vehicle Climate Control Loads. Proceedings of the 15th Electric Vehicle Symposium, Brussels, September 30-October 3, 1998. http://www.nrel.gov/vehiclesandfuels/ancillary loads/pdfs/evs15paper.pdf.

Farrington, Ret al. Effect of Solar-Reflective Glazing, Fuel Economy, Tailpipe Emissions, and Thermal Comfort. SAE Paper No. 2000-01-2694.

Friedrich, A. Options to Reduce Greenhouse Gas Emissions from Road Transport. International Symposium on Near-Term Solutions for Climate Change Mitigation in California. March 5-7, 2007.

Harris Interactive. PPG Sungate Windshield Study. June 29, 2007

Forbes, ·2008. www.forbesautos.com/advice/toptens/most-wanted-tech-features-slideshow 7.html

Hoke, P, C Greiner. Vehicle Paint Radiation Properties and Affect on Vehicle Soak Temperature, Climate Control System Load, and Fuel Economy. SAE Paper No. 2005-01-1880. ·

iugara, E. Fiat Research Centre, Italy. Envelope optimisation (colour, roof insulation, advanced glazing). Presented at the 23-24 October 2006 International

Energy Agency, Paris, Meeting: Cooling Cars with Less Fuel: Improving the On-Road Performance of Motor Vehicles. 2006.

Pause, B. Driving More Comfortably with Phase Change Materials. Technical Textiles International. March 2002.

Pilkington Automotive. Teleconference with Air Resources Board. May 29,2008.

Pittsburgh Glass Works. Teleconference with Air Resources Board, January 8.2009.

Rugh, J et al. Significant Fuel SaVings and Emission Reductions by Improving Vehicle Air Conditioners. Mobile Air Conditioning Summit, Washington DC. April 14-15,2004.

Rugh, Jet al. Reduction in Vehicle Soak Temperatures and Fuel Use from Cabin Ventilation, Solar-Reflective Paint, and a New Solar-Reflective Glazing. SAE Paper No. 2007-01-1194.

Rugh,), R Farrington. Vehicle Ancillary Load Reduction Project Close-Out Report. Technical Report NREUfP-540-42454, January 2008.

Southwall Technologies. Presentation to California Air Resources Board. June 6, 2008.

Attachments

Appendix A. Proposed Regulation and Test Procedures

Appendix B. Emissions Inventory

Appendix C. Additional Information

State of California
AIR RESOURCES BOARD

Appendix A

PROPOSED REGULATION ORDER

Cool Car Standards and Test Procedures - 2012 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

Date of Release: May 8, 2009

PROPOSED REGULATION ORDER

Adopt new Subarticle 9, sections 95600, 95601, 95602, 95603, 95604, and to 95605, title 17, California Code of Regulations, to read as follows: .
(NOTE: The entire text of sections 95600, 95601, 95602, 95603, 95604, and to 95605 is new language.)

Subarticle 9. Cool Car Standards and Test Procedures - 2012 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

§ 95600. Purpose. The purpose of this article is to reduce greenhouse gas emissions from 2012 and subsequent model-year passenger cars, light-duty trucks, and medium-duty vehicles less than or equal to 10,000 pounds GVW.

NOTE: Authority cited: Sections 38501, 38510, 38560, 38562, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38562, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95601. Applicability. This article applies to:

(a) manufacturers of new 2012 and subsequent model-year passenger cars, light-duty trucks, and medium-duty vehicles less than or equal to 10,000 pounds GVW.

(b) manufacturers of vehicle glazing.

(c) collision repair facilities.

(d) persons that provide vehicle window replacement services.

NOTE: Authority cited: Sections 38501, 38510, 38560, 38562, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550,38551,38560,38562, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95602. Definitioris.

(a) In addition to the definitions found in title 13, California Code of Regulations, Section 1900, which are incorporated by reference herein, the following definitions also apply to this subarticle:

(1) "Backlite" means the rearwindow of a vehicle, whether composed of glass or some other transparent or translucent material.

(2) "Collision repair facility" means any business involved in the repair or restoration of damaged vehicles, including replacement of transparent or translucent components.

(3) "Deletion windows" are areas on a vehicle's glazing specifically designed to facilitate transmission of electromagnetic signals into and out of the vehicle.

(4) "Direct solar reflectance" or "Rds" means the ratio of reflected solar flux to the incident solar flux, Le., the ratio of the solar energy that is reflected outward by a paint or glazing system to the amount of solar energy impacting the paint or glazing system, usually expressed as a percent. Rds includes ultraviolet, visible, and infrared reflectance.

(5) "Glazing" means all transparent or translucent portions of the vehicle body designed to allow occupants to see outside of the vehicle or others to see in, whether made of glass or some other material.

(6) "Infrared Reflectance" means the ratio of infrared solar energy which is reflected outward by the glazing system to the amount of infrared solar energy impacting the glazing system, usually expressed as a percent. The infrared wavelengths are considered to be those falling between 780-2500 nanometers.

(7) "Privacy Glass" is glazing that is rear of the B-pillar in a vehicle that has less than 70 percent visible light transmittance.

(8) "Referenced to a glazing of 4 mm thickness" means that the glass composition will meet the required standard when it is produced in a 4 millimeter thickness. Glazing greater than or less than this thickness may have a different Tts value than that of the 4 millimeter thick glazing.

(9) "Rooflite" means all transparent or translucent materials, whether fixed or not, on the top surface, or roof, of a vehicle.

(10) "Sidelites" means all windows, whether fixed or not, on the sides of the vehicle, composed of glass or any other transparent or translucent material.

(11) "Solar absorptance" means the amount of solar energy that is absorbed by the glazing system, expressed as percent.

(12) "Solar spectrum" means the full solar wavelength range of 300 to 2500 nanometers.

(13) "Total Solar Transmittance" or "Tts" means the ratio of the transmitted solar flux to the incident solar flux, i.e., the ratio of the amount of solar energy that passes through the glazing (including energy absorbed and subsequently re-radiated to the interior) to the amount of solar energy falling on the glazing, usually expressed as a percent.

(14) "Vision glass" is glazing that meets a minimum 70 percent visible light transmittance.

(15) "Windows" mean's all glazing, including the windshield, sidelites, backlite(s), and any roof component that transmits light.

NOTE: Authority cited: Sections 38501, 38510, 38560, 38562, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505, 38510, 38550, 38551, 38560, 38562, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95603. Automotive Glazing Standards.

(a) Except as allowed in paragraph (c), the following glazing areas for new passenger cars, light-duty trucks, and medium duty vehicles less than or equal to 10,000 pounds GVW must not exceed the specified transmission of total solar energy (Tts) into the vehicle when the. vehicle is parked:

(1) For 2012 model year vehicles, at least seventy-five percent of each manufacturer's total vehicle sales must use a windshield with a Tts less than or equal to fifty percent (50%).

(2) For 2013 model year vehicles, the windshield must have a Tts less than or equal to fifty percent (50%).

(3) For 2014 and subsequent model year vehicles, the windshield must have a Tts less than or equal to forty percent (40%).

(4) For 2012 and subsequent model year vehicles, the rooflite(s), if any, must have a Tts less than or equal to thirty percent (30%), referenced to a glazing of 4 millimeter thickness.

(5) For 2012 and subsequent model year vehicles, sidelites and backlite(s) meeting 70 percent visible light transmittance

requirements must have a Tts less than or equal to sixty percent (60%), referenced to a glazing of 4 millimeter thickness.

(6) For 2012 and subsequent model year vehicles, sidelites and backlite(s) not meeting 70 percent visible light transmittance requirements must have a Tts less than or equal to forty percent (40%), referenced to a glazing of 4 millimeter thickness.

(b) Total solar transmittance shall be measured using International Standards Organization Standard 13837 Road Vehicles - Safety Glazing Materials - Method for the Determination of Solar Transmittance at 4 *mls,* Convention A, dated April 15, 2008, which is incorporated by reference herein, or using an alternate test methodology that results in equivalent solar control, approved in advance by the Executive Officer.

(c) Labeling. [Reserved]

(d) Exemptions. The following are excluded from the standards in paragraph (a) for solar control glazing.

(1) Glazing that is internal to the conditioned space, having both surfaces exposed to the controlled environment (e.g., taxi cab dividers).

(2) Glazing for spaces in the vehicle that are not normally designed to be occupied or environmentally conditioned while the vehicle is in motion (e.g., pick-up bed covers, camper shells).

(3) Deletion windows as necessary for the purpose of allowing increased electromagnetic signal penetration. These deletion windows may be formed by partial or total removal of applied solar reflective coating or by non-application of such material in the specified area. The area of the deletion window shall not exceed thirty percent (30%) of the total window area, and the total material removed or not applied shall not exceed ten percent of the total material applied to the entire window. These limits apply to each individual piece of glazing utilizing deletion windows.

(e) Manufacturer Requirements.

(1) For 2012 and subsequent model-year vehicles, manufacturers must provide information in the vehicle owner's manual that notifies the consumer that in the event any glazing must be replaced, failure to use glazing that complies with paragraph (a) may impair the ability of the air conditioner to properly cool the vehicle. A table must be

included in the vehicle owner's manual that indicates the total solar transmittance for each individual piece of glazing used in that model vehicle.

(2) For 2012 and subsequent model-year vehicles, manufacturers must include in the owner's manual the location of all deletion windows, pictorially and with measurements, to aid in the positioning of aftermarket devices.

(3) As a condition to receive an Executive Order for 2012 and subsequent model-year vehicles, manufacturers must submit to the Executive Officer with each initial certification application the direct solar reflectance, solar absorptance, and total solar transmittance of the glazing proposed, and submit for review and approval facsimiles of the information in (1) and (2). Manufacturers shall also submit for review and approval a facsimile of the marking(s) included on the window glazing.

(4) Records Retention.

(A) Beginning with the 2012 model-year, manufacturers must maintain records of the direct solar reflectance, solar absorptance, and total solar transmittance of the glazing. utilized for each model vehicle for ten (10) years after the end of that model-year.

(B) The records in (A) must be provided within 30 days of request by the California Air Resources Board.

(C) The records must include the following information: model-year, engine test group, model name, direct solar reflectance, solar absorptance, and total solar transmittance for each type (e.g., absorbing, reflecting, privacy) and position (e.g., windshield, sidelite, rooflite, backlite) of glazing used.

(f) Window Replacement Requirements.

(1) Collision repair facilities and other persons that provide vehicle window replacement services in California must use replacement glazing that is certified to meet the requirements of paragraph (a), and as described in the table included in the vehicle owner's manual for 2012 and subsequent model-year vehicles that indicates the total solar transmittance for each individual piece of glazing.

(2) The replacement glazing shall include [reserved] as required under paragraph (c).

(3) Records Retention.

(A) Collision repair facilities and other persons that provide vehicle window replacement services shall retain records showing that replacement glazing for 2012 and subsequent model-year vehicles meets the requirements in paragraph (a).

(B) These records must be retained for a period of not less than five (5) years.

(C) Such records must be provided within 30 days of request by the California Air Resources Board.

(g) Glazing Manufacturer Requirements.

(1) Glazing manufacturers must certify that the glazing provided for 2012 and subsequent model-year vehicles meets the solar performance represented to purchasers, using the test procedure indicated in paragraph (b).

(2) The glazing shall include appropriate label(s) indicating solar performance as required in paragraph (c).

(3) Records Retention

(A) Glazing manufacturers shall retain records showing that glazing provided for 2012 and subsequent model-year vehicles meets the requirements in paragraph (a).

(B) These records must be retained for a period of not Jess than five (5) years.

(C) Such records must be provided within 30 days of request by the California Air Resources Board.

NOTE: Authority cited: Sections 38501, 38510, 38560, 38562, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501,38505,38510,38550,38551,38560,38562, 39003, 39500, 39600, and 39601, Health and Safety Code.

§ 95604. Manufacturer Compliance Options. The vehicle manufacturer may choose to pursue alternate compliance options. Manufacturers doing so must notify the Executive Officer of the alternative being utilized for the specified vehicle model in the initial certification application. Improved performance of glazing in one position may offset lesser performance in another. When pursuing these options, glazing performance (Tts) shall be individually averaged on an

area basis for the windshield, backlite(s), sidelites forward of the B-pillar, sidelites rear of the B-pillar, and rooflite(s), if any. Where appropriate, and with approval in advance by the Executive Officer, these options may be combined.

(a) Improved solar management for the windshield. For each two (2) percentage points that the Tts of the windshield for a specified model is reduced beyond the requirement, one of the following options may be elected:

(1) The maximum Tts for the sidelites and backlite(s) for vision glass is increased by three percentage points; or

(2) The maximum Tts for the sidelites and backlite(s) not meeting 70 percent visible light is increased by three percentage points; or

(3) The maximum Tts for the rooflite(s) is increased by two percentage points.

(b) Improved solar performance for the backlite(s) or sidelites.

(1) For passenger cars, jf the Tts of the backlite is reduced from sixty percent (60%) to fifty percent (50%), the Tts for the windshield may be increased by up to four (4) percentage points; or

(2) If the average Tts of the sidelites forward of the B-pillar is reduced from 60% to 50%, the Tts for the windshield may be increased by up to two (2) percentage points.

(3) If the Tts of the sidelites and backlite(s) of passenger cars averages no more than fifty percent (50%), then the Tts for the windshield may be less than or equal to fifty percent (50%).

NOTE: Authority cited: Sections 38501, 38510,.38560, 38562, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38562, 39003, 39500, 39600, and 39601, Health and Safety Code.

§95605. Enforcement and Penalties.

(a) *Penalties.* Penalties may be assessed for any violation of this subarticle pursuant to Health and Safety Code section 38580. Each day during any portion of which a violation occurs is a separate offense.

(b) *Injunctions.* Any violation of this subarticle may be enjoined pursuant to Health and Safety Code section 41513.

(c) *Revocation.* The Executive Officer may revoke any Executive Order issued pursuant to this subarticle for a violation of this subarticle.

(d) Each day or portion thereof that any record required by this subarticle remains unsubmitted, is submitted late, or contains incomplete or inaccurate information, shall constitute a single, separate violation of this subarticle.

NOTE: Authority cited: Sections 38501, 38510, 38560, 38562, 38580, 39600, and 39601, Health and Safety Code. Reference: Sections 38501, 38505, 38510, 38550, 38551, 38560, 38562, 39003, 39500, 39600, and 39601, Health and Safety Code.

State of California
AIR RESOURCES BOARD

Appendix B

Emissions Modeling

Cool Car Standards and Test Procedures

Date of Release: **May 8, 2009**

This Appendix discusses how staff determined the emission benefit from the proposed regulation.

Table of Contents

List of Tables

List of Figures

List of Acronyms

AB	Assembly Bill
ADVISOR	ADvanced Vehicle SimulatOR model, deve10ped by NREL
ARB	California Air Resources Board
B-Pillar	The roof support between a car's front door window and rear side window
CO	Carbon Monoxide
CO_2	Carbon Dioxide
EMFAC	EMission FACtors model, developed by ARB
LBNL	Lawrence Berkeley National Laboratory
MMT	Million Metric Tons
mpg	Miles per gallon
NOx	Oxides of Nitrogen
NREL	National Renewable Energy Laboratory
PPD	Predicted Percent Dissatisfied; a measure of the percentage of people likely to feel too hot or too cold in a given environment
SC03	Air conditioner test cycle
SFTP	Supplemental Federal Test Procedure
SUV	Sport Utility Vehic1e
Tts	Total Solar Transmission
VMT	Vehicle Miles Traveled

I. DETERMINING THE PROJECTED BASELINE INVENTORY

A. ARB's EMFAC Model

Projected inventories for the Air Resources Board (ARB) are typically generated using EMFAC (ARB's EMission FACtors model). EMFAC provides activity data for vehicle miles traveled (VMT), including distribution of VMT throughout the day, mileage accrual rates, cumulative mileage, vehicle retirement/relocation rates, and other pertinent information such as vehicle population and age distribution. Activity and other inputs are extrapolated into the future; current.projections extend until 2040.

Although the focus of the model is assessment of tailpipe emissions, EMFAC incorporates some assumptions regarding air conditioner use and impacts. EMFAC includes an air conditioner use rate of 10 percent for California. This figure is substantially lower than projections by the National Renewable Energy Laboratory[1] (NREL) and others[2] of air conditioner use in California. Staff believes this is largely due to the temperature averaging process within EMFAC, which results in temperatures that are milder than actual conditions. Further, the estimated effect of air conditioner use on fuel consumption is substantially lower in EMFAC than elsewhere in the literature. These issues are discussed in more detail in subsequent sections. The result of these issues is that the projected baseline emissions from mobile. air conditioner use in California appear to be underestimated by EMFAC. Therefore, staff examined other ways to determine the anticipated effect of this proposal on mobile air conditioner-related emissions.

B. Thermal Comfort Model

The air conditioner in a vehicle is typically activated because the vehicle occupant(s) is uncomfortably warm. There are a variety of thermalcqmfort models in use today to translate the measured or modeled perceived level of discomfort into likely air conditioner use rates. NREL has developed a thermal comfort model which estimates a vehicle occupant's comfort level during winter warm-up or summer cool-down. Like most thermal comfort models, NREL's model is based on Fanger's heat balance equations.

The underlying premise of thermal comfort modeling is that if a person is thermally uncomfortable, he or she will take action to become more comfortable (Le., turn on the heat or the air conditioner). A person's sense of thermal comfort is primarily related to their thermal balance. Physical activity, clothing, air temperature, mean

1 The U.S. Department of Energy's National Renewable Energy Laboratory is the nation's primary laboratory for renewable energy and energy efficiency research and development. NREL's mission and strategy are focused on advancing our nation's energy goals. For more information about this. national laboratory, visit http://www.nrel.gov

2 For example, see the Intergovernmental Panel on Climate Change and the Technology & Economic Assessment Panel's Special Report: Safeguarding the Ozone Layer and the Global Climate System, Chapter 6, Mobile Air Conditioning. Available at http://www.ipcc.ch/ipccreports/sroc.htm.

radiant temperature,[3] air velocity, and humidity all influence the body's thermal balance. Given these factors, thermal comfort can be modeled, and presented as the "predicted percent dissatisfied", or "PPD". The PPD is a measure of the percentage of people likely to feel too hot or too cold in a given environment. In the "too hot" environment, PPD equals the percentage of people who would turn on the air conditioner (Fora discussion of NREL's thermal comfort model, see Johnson, 2002, or Chaney et al., 2007).

NREL's thermal comfort model predicts that mobile air conditioners are used for 28 percent of the VMT nationwide. Not surprisingly, states like Arizona (58 percent) and Florida (57 percent) have much higher use rates than states like Alaska (6 percent) and Wyoming (15 percent). California is near the national average, with an air conditioner use estimate of 29 percent (Rugh et al., 2004). This estimate takes into account variations in trip behavior by time of day and year, and the VMT for each of the seven major cities in California that were analyzed by NREL. Results from each city were weighted by population figures. Staff believes the NREL air conditioner use rate is more appropriate than the use rate currently incorporated into EMFAC because of the way the temperature data is treated within EMFAC, which results in the incorporation of more mild temperatures than are actually seen in California, especially during the summer. Therefore, staff utilized NREL's California air conditioner use rate when determining baseline air conditioner-related emissions as well as anticipated benefits ensuing from the proposed regulation.

C. The Effect of Air Conditioners on Emissions

Use of the air conditioner can substantially increase exhaust emissions. This is primarily due to the increased fuel consumed from the extra load on the engine caused by the air conditioner compressor. The/oad effect increases as vehicle fuel efficiency increases. A vehicle that achieves 25 mpg without the air conditioner might see fuel consumption increase by 20 percent when the air conditioner is in use, while fuel consumption increases of 50 to 100 percent have been estimated for an 80 mpg vehicle (see, for example, Farrington et al., 2000). Large trucks generally have a smaller impact due to the higher power engines used, and relatively lower baseline fuel efficiency.

3 Mean radiant temperature (MRT) is a term used to account for the fact that temperatures are not uriiform. For example, if a person is sitting in a hot vehicle, the temperature is generally hotter at the instrument panel than in the foot well. The MRT is the uniform black body surrounding temperature to which a person would exchange the same amount of heat as they do in the actual non-uniform thermal environment. The MRT inside a vehicle may be considerably above ambient if the vehicle were sitting in the sun for hours.

4 NREL's published literature is by state. Some references suggest a 34 percent nationwide figure, derived from NREL's state-by-state rates, but in its estimate of national air conditioner use, the United States Environmental Protection Agency (EPA) reports that NREL provided a national air conditioner use rate of 28% of the VMT, compared to EPA's estimate of around 24% of the VMT. See EPA, 2006.

D. The Baseline Inventory

Staff's estimate for California's indirect mobile air conditioner related emissions is based on a simple model incorporating work done by Lawrence Berkeley National Laboratory (LBNL) and the NREL work effort described above. The model utilizes typical California air conditioner use rates as established by NREL, adjusted for the detailed VMT and fleet operations inherent in EMFAC, the impact of air conditioner use on fuel use, and the relationship between changes in soak temperature and air conditioner fuel use developed by NREL. The air conditioner on-time depends on factors such as temperature, humidity, vehicle orientation, parking conditions, and vehicle color mix. After adjusting for the potential indirectair conditioner credits available under AB 1493, the adjusted baseline level of CO_2 emissions from mobile air conditioner use was calculated. The model framework was developed by LBNL, and is shown in Table B-1 for 2040.

Model inputs include the number of vehicles and VMT projected for 2040. EMFAC projects that slightly over half of the projected 2040 VMT for affected vehicles is from passenger cars, while the balance (49.6 percent) is from light-duty trucks and medium-duty vehicles. Baseline vehicle fuel consumption for 2040 was set at 41 miles per gallon (mpg) average for the affected vehicles.[5] Indications are that these more fuel efficient vehicles will have a larger greenhouse gas emissions impact from air conditioner use. Therefore, staff assumed that the typical current impact of 19 percentincreased fuel consumption with air conditioner use[6] would increase to 26 percent by 2040.

E. Baseline InventoryAdjustment

Using vehicle population and VMT from EMFAC, air conditioner use rate estimated above, and the effect of that air conditioner use on fuel consumption and CO_2 emissions discussed above, staff projected a baseline fuel consumption estimate for 2040, shown in Table B-1, of 0.80 billion gallons offuel per year. However, an adjustment to this projected baseline inventory is necessary, due to the credit system that was included in regulations developed in response to Assembly Bill (AB) 1493, and adopted in 2004. That regulation includes carbon dioxide ($C0_{2)}$ credits for reducing indirect air conditioner emissions.? One way to obtain credits is to upgrade a typical current system using a pneumatically controlled fixed displacement compressor to one using an externally controlled variable displacement compressor. A fixed compressor operates in an on/off mode. With significant cooling demand,

5 This figure is based on staff's population-weighted average fuel economy estimates ranging from 45 mpg for passenger cars to 30 mpg for medium-duty vehicles. .

6 This figure is based on testing performed for the Supplemental Federal Test Procedure (SFTP, 1996) and Clean AirVehicle Technology Center (CAVTC, 1999). In the SFTP tests, small cars had 34 percent higher emissions with the air conditioner on, while midsize cars had a 24 percent Increase, and larger vehicles such as large trucks and sport utility vehicles (SUVs) had more modest emission increases of around11 percent.

7 Indirect emissions are tailpipe emissions and are the result of the load of the air conditioner on the engine; using the air conditioner increases the load, and the fuel consumption, of the vehicle, compared to operation of the vehicle with the air conditioner off.

such as occurs with high interior conditions or with very hot ambient conditions, the compressor works constantly. But as cooling demand is reduced, the fixed compressor adjusts to achieve the desired temperature by cycling on and off and/or by adding heat back into the cooled air. Fuel consumption under these conditions is significantly increased. A variable compressor compresses only the amount of coolant needed to achieve the needed temperature reduction; these compressors are able to operate at higher efficiencies under steady state conditions than are the fixed compressors. However, when cooling demand is high, performance is similar to that of a traditional fixed compressor.

A study completed for the AB 1493 regulation estimated the effect of advances in air conditioning systems, including a move to externally controlled variable displacement compressors from pneumatically controlled fixed displacement compressors (NSCCAF, 2004). As reported in the Staff Report for AB 1493,[8] such a change in compressor type, coupled with improved air recirculation and a change in refrigerant to HFC-152a, would reduce the fuel used for air conditioning by around 2.3 percent for cars and minivans, and just over two percent for trucks and sport utility vehicles (ARB, 2004). To estimate the benefits of this proposal, staff conservatively assumed that all manufacturers would choose to generate these credits. This assumption ensures thatthe benefit from switching to better air conditioners is not inappropriately double counted in the projected benefit from this regulation. Based on EMFAC's projected VMT split between cars and trucks in the inventory, staff reduced the estimated fuel used for air conditioning in the projected baseline inventories by 2.2 percent. The effect of staff's proposal was layered onto this adjusted projected baseline inventory.

Using the inputs discussed above, as summarized in Table B-1, 0.78 billion gallons of fuel per year are projected to be consumed for mobile air conditioner operations in 2040. This level of fuel use is associated with 6.92 million metric ton (MMT) C02.

Table B- 1. Baseline Model Inputs.

	Input			Source/Calculation
F4	2040 registrations for 2012+MY	36.98	million vehicles	EMFAC
F5	2040 VMT per day, 2012+MY	1251.58	million miles/day	EMFAC'
F6	VMT per year	434.30	billion miles/yr	F5*347/1000; 347 is the weekday-equivalent days/year
F7	Annual fuel use	10.59	billion *gal/yr*	*F6/41* mpg estimate
F8	Increased fuel consumption from *ale* use	26%		Conservative increase from current 19% average
F9	% time *ale* is on	29%		Rugh et al., 2004
	Output			
F13	*ale* contribution to fuel use	0.799	billion *gal/yr*	F7*F8*F9
F14	Adjusted for AB 1493	0.781	billion gallyr	F13*.978
F15	*ale* contribution to CO_2 emissions	6.92	MMT$C0_2$/yr	F14*8.857 MMT $C0_2$/Billion gal. gasoline

[8] Staff directs the reader to the Staff Report for the AB 1493 regulation (ARB, 2004), specifically the discussion surrounding Table 5.1-12 (page 75).

II. MODELING THE EMISSION BENEFIT

Staff's proposal will reduce the interior temperature of vehicles parked in the sun. A cooler interior means less energy must be removed from the vehicle to make it comfortable. If less energy is needed, the air conditioner will operate at lower load and/or can be made smaller. A smaller air conditioner compressor will reduce the fuel used and emissions generated for air conditioning, and is lower in weight (requiring less fuel and emissions to move the vehicle). These fuel benefits are as'sociated with reduced CO_2 emissions.

AB 32 requires a reduction in greenhouse gas emissions of around 25 percent in 2020. Further reduction goals for 2050 have been specified by Executive Order. Using the approach discussed below, the benefits for the proposed regulation were determined for 2020 and 2040, which is as far in the future as EMFAC projects VMT and other data at present. The mileage from remaining pre-2012 model year vehicles is low by 2040, so the projections for 2040 should be close to those at full implementation.

A. Anticipated Reductions in Soak Temperature

To determine the expected reduction in soak temperatures, staff made some simplifications and assumptions, based on data presented in the Staff Report and in Appendix C.

- 50 percent of total solar heat gain through glazing passes through the windshield, 30 percent through the sidelites, and 20 percent through the backlite(s). By 2040,50 percent of vehicles in these classes are expected to have a rooflite(s) (Peter, 2004). A similar heat gain is obtained through a rooflite as through a windshield.
- One:third of sidelite surface area is estimated to be forward of the B-pillar; two-thirds are rear of the B-pillar. This likely underestimates forward glazing for pick-up trucks, and overestimates it for SUVs.
- All-around solar management glazing with a total' solar transmission (Tts) of 60 percent reduces the interior soak temperature by 6°C compared to clear or light green tint.
- All-around solar management glazing with a total solar transmission of 50 percent (as typically would be achieved for laminated glass using glazing with a direct solar reflectance of around 30 percent) reduces the interior soak temperature by aOC compared to clear or light green tint.
- All-around solar management glazing with a total solar transmission of 40 percent (as typically would be achieved for laminated glass' using glazing with a direct solar reflectance of 40 to 43 percent) reduces the interior soak temperature by at least gOC compared to clear or light green tint.

- Current rooflites are estimated to have a total solar transmittance of 40 percent. .Reducing the transmittance to 30 percent is estimated to reduce interior soak temperatures by at least 1°C.
- Some vehicle glazing already incorporates solar control. Staff estimates that -40 percent of sidelites forward of the B-pillar already achieve a total solar transmission near the proposed 60% level. Therefore, projected soak temperature reductions are limited to the 60% that do not.
- Staff estimates that 25% of glass rear of the B-pillar in passenger vehicles already achieves a total solar transmission near the proposed 60% level. Therefore, projected soak temperature reductions are limited to the 75% that do not.
- For SUVs and pick-up trucks, adjustments are made for the current use of privacy glazing. Staff estimates that 65 percent of SUVs and pick-up trucks use privacy glazing where allowed in the veh.icle.[9]

When fUlly implemented, the proposed regulation requires the use of windshields meeting a 40 percent total solar transmission. This corresponds to 4.5°C anticipated soak temperature reduction. This app.lies to all vehicles. In addition to this, additional soak temperature reductions are expected from the proposed requirements for sidelites, backlite(s), and rooflite(s). These vary by vehicle type. A total temperature reduction of 7.7°C, is estimated for typical sedans, and 6.7°C for SUVs and pick-up trucks. The calculations are presented in Table B-2, and show the temperature reduction, glazing position corrections, and corrections for current technology use. For example, for car sidelites rear of the B-pillar, 6°C (anticipated temperature .reduction with all-around glazing meeting a 60% Tts requirement) times 30% (portion of solar heat gain through sidelites) times 67% (portion of sidelites rear of the B-pillar) times 75% (portion of those sidelites not currently using solar management glaZing that limits total solar transmission to around 60%) results in a O.goC anticipated soak temperature reduction,

Table B- 2. Soak Temperature Reductions.

	Cars		SUVs/Pick-ups	
Windshield-all vehicles	gOC*50%	4.5°C	gOC*50%	4.5°C
Rooflite(s)-all vehicles	1°C	1°C	1°C	1°C
Sidelites-cars, front	6°C*30%*33%*60%	*OAoC*	-	
Sidelites-cars, rear of B-pillar	6°C*30%*67%*75%	O.goC	-	
. Backlite(s)- cars	6°C*20%*75%	O.goC	-	
Sidelites-SUVs, PIUs, Front	-		6°C*30%*33%*60%	0.36°C
Sidelites-SUVs, PIUs, Rear	-		6°C*30%*67%*35%	*OA2°C*
Backlite(s)-SUVs, PIUs	-		6°C*20%*35%	*OA2°C*
Total		7.7°C		6.7°C

9 Benefit from the solar control requirements for privacy glazing cannot be estimated because staff lacks sufficient data as to current average solar management performance for privacy glazing at this time.

B. Converting Soak Temperature Reductions to Reduced Fuel Use

To translate reduced soak temperatures into a potential reduction in air conditioner compressor size, NREL developed a transient air conditioner model.[10] Vehicles were equipped with technologies to reduce net solar load, and interior temperatures were measured and compared to baseline vehicles. Maintaining existing compressor power, the cabin cools more quickly in the solar control vehicle than in the baseline vehicle. The model then reduces compressor power to decrease the cooling capacity of the system until it matches the baseline condition. In an assessment of a Cadillac STS, meeting the temperature goal required a 5.7 kilowatt air conditioning system for the baseline vehicle. For the experimental vehicle, which had a lower starting temperature, a 4.0 kilowatt system was adequate to meet the goal. This is a 30 percent reduction in cooling load (Rugh et al., 2007).

After the potential reduction in air conditioner compressor size was estimated, NREL modeled fuel use for the smaller compressor using their ADVISOR (ADvanced Vehicle SimulatOR) model, which is designed to assess the performance and fuel economy of conventional, electric, and hybrid vehiCles. Reducing the air conditioner load by 30 percent resulted in a 26 percent reduction in air conditioner' fuel use,' or 1.2 percent reduced air conditioner fuel use per degree F reduction in interior temperature (Rugh et al., 2007).

Staff's modeling approach uses this relationship between reduced soak temperatures and air conditioner fuel use. Although the Cadillac is a single vehicle, it is approximately midway in size between smaller cars and SUVs, so the figure seems reasonable. It is also more conservative than earlier figures for a Ford Explorer developed by NREL of 2.2 percent reduced fuel use per degree F (Rugh et al., 2001).

While staff believes that the air conditioner use factor should account for variable inputs such as the orientation of parked cars and the insolation rate, the calculated benefit reflects a 20 percent downward adjustment to ensure that the benefits are not overstated. This adjustment will accommodate non-included variables, such as the fraction of vehicles without a properly functioning air conditioner.[11]

Staff applied the reduced interior temperatures to the work demand for an externally controlled variable compressor. Because the variable compressor works only as hard as is needed to achieve comfort, the reduced interior temperatures will result in lower compressor demand, and reduced associated emissions. A similar benefit would be expected if a fixed compressor were downsized to more properly fit the new

10 For an in-depth discussion on how expected reductions in interior soak temperature are related to anticipated reductions in air conditioner use or downsizing of air conditioner capacity, and estimates of reduced fuel consumption and therefore reduced CO_2 emissions, staff refers the reader to Rugh and Farrington (2008) and the documents referenced therein.

11 Cooling in a vehicle without air conditioning generally relies on the windows. Aerodynamics, and therefore fuel consumption, suffers when the windows are down. To the extent that a cooler interior leads to the windows remaining up at freeway speeds, staff expects some benefit to accrue with the proposed regulation even from vehicles without functional air conditioners.

lower demand.[12] Since an air conditioner that is larger than needed is inefficient and has higher cost, staff anticipates that over time, manufacturers will re-size the air conditioner to account for the lower solar load; this would be done automatically with new models, typically introduced every five years.

C. Emission Benefit

Table B-3 reiterates model inputs presented in Table B-1. In addition, the model outputs in terms of reduced fuel consumption and reduced CO_2 emissions are presented.

1. Reduced Compressor Power Needs

According to this model, with nearly full implementation, the anticipated reductions in soak temperature would result in adjusted reduced CO_2 emissions of 0.86 MMT per year when considering only the reduced compressor power needs for cool cars.

As a check of staff's methodology, one glass manufacturer who has developed a thermal simulation model to assess the benefits of various solar control products offered to run simulations on the probable benefits of a variety of control scenarios.

Table B- 3. Model Inputs and Outputs.

	Input			Source
F4	2040 registrations for 2012+MY	36.98	Mil. vehicles	EMFAC
F5	2040 VMT per day, 2012+MY	1251.58	Mil. miles/day	EMFAC
F6	VMT per year	434.30	Bil. miles/yr	*F5*347/1000*
F7	Annual fuel use	10.59	Bil. gal/yr	*F6/41* mpg estimate
F8	increased fuel consumption due to *a/c* use	26%		Conservative increase from current 19% average
F9	% time *a/c* is on	29%		Rugh et al., 2004
	Output			
F13	*a/c* contribution to fuel use	0.799	Bil. *gal/yr*	F7*F8*F9
F14	Adjusted for AB 1493	0.781	Bil. gal/yr	F13*0.978
F15	*a/c* contribution to CO_2 emissions	6.918	$MMTCO_2/yr$	F14* 8.857 conversion to $MMTC0_2$
F17	Effect of cool cars proposal (reduce 7.7°C (13.8 OF) or PCs and 6.7°C (12.1 OF) for LDT/MDVs)			
F18	Reduction in *a/c* fuel use PC	16.6%		1.2% per OF * 13.8 OF
F19	Reduction in *a/c* fuel use LDT MDV	14.5%		1.2% per OF * 12.1 OF
F20	Adjusted *a/c* contribution to fuel use	0.660	Bil. gal/yr	(.504*F14-(F18*F14))+(.496*F14-(F19*F1
F21	Reduced CO_2 emissions	1.076	$MMTC0_2/yr$	(F14-F20)*8.857 $MMTC0_2$/Bgai
F22	Adjusted Reduced CO_2 emissions	0.861	$MMTC0_2/yr$	adjust 20% downward for uncertainties

12 Air conditioner systems for vehicles are typically sized to achieve a cool-down of a black vehicle parked in the Phoenix summer sun to a comfortable temperature in a set amount of time, so if the interior is less hot, the desired temperature goal will be achieved more quickly. Therefore, to attain ,the same overall air conditioner performance, a smaller (lower kilowatt) air conditioner can be used.

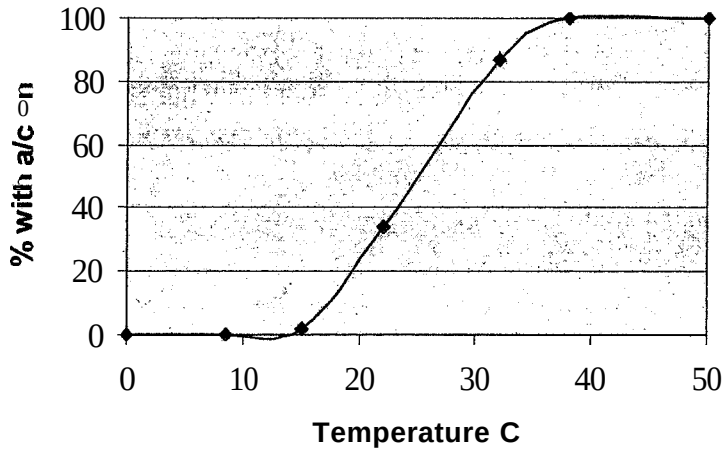
The model results indicated that the use of an infrared reflective windshield can reduce the CO_2 emissions by 2.76 MMT per year. This is higher than staff's modeled results, but seems consistent.

2. Reduced Air Conditioner Use

In addition to the benefits to be obtained through reduced load on the air conditioner, the cooler interior temperature will result in reduced use of the air conditioner during periods of mild-to-moderate temperatures and/or short soak times. During these periods, a person might use the air conditioner under current conditions, but with new solar controls in place, the air conditioner might not be necessary for thermal comfort. These times, termed "shoulder months" by staff, would be associated with additional benefits. To quantify these benefits, staff assumed that shoulder months occur in relatively mild temperatures where some but fewer than half of people are currently expected to activate the air conditioner. Figure B-1 shows a typical air conditioner usage curve developed for Phoenix, AZ.[13]

The figure shows the percent of people dissatisfied with the thermal environment. A person will have the air conditioner button in the car switched to the on position based on the following factors: the ambienttemperature in Phoenix, average temperature of the surrounding surfaces, air velocity in the car, summer clothing, and a driving metabolic rate. These data do not include the effect of increased interior temperatures relative to ambient temperatures. Updated figures are available that offer a conservative assumption that the interior temperature is 10°C warmer than ambient. Staff opted not to use the updated figures because the air conditioner use rates incorporated in the model are based on figures such as this one. Updating to the newer figure would result in expected increases in air conditioner use, which have not yet been estimated by NREL.

Figure B- 1. Typical Air Conditioner Usage in Phoenix, AZ.



13 Data to generate curve provided by John Rugh, NREL.

To determine when mild-to-moderate conditions might occur in California, staff turned to EMFAC's hourly temperature data by hour, averaged for California. These data are presented in Table 8-9, located at the end of this document. Perceptions o(heat are also influenced by humidity. The combination of temperature and humidity is referred to as the "heat index". EMFAC contains humidity data by hour, averaged for California. The humidity in California is moderate, so the heat index is generally within 2 degrees of the temperature. Since the effect is small, staff did not adjust the temperatures for humidity. Doing so would have resulted in the addition of one more shoulder month designation for rush hour. The heat index is shown in Table 8-4.

Using Figure 8-1 above, staff defined a "shoulder month" as one with temperatures between 18°C (64°F) and 24°C (75°F). Peak temperatures typically occur around 2 p.m., and "shoulder month" peak temperatures occur from February through May, and in November. If the evening rush is examined, four months would be considered shoulder months (April through June and October). During the morning rush, shoulder month conditions are met between April and October. Recall that the averaging process included in EMFAC makes California's temperatures seem more mild than they are in actuality. However, for the purpose of determining shoulder

Table 8- 4. California Heat Index.

Time	Temperature (F)	Relative Humidity	Heat Index	Correction
0	55.2	76.7	53	-2
100	54.5	77.7	53	-2
200	54.0	78.2	52	-2
300	53.4	78.3	51	-2
400	53.1	79.6	50	-3
500	53.0	79.9	50	-3
600	54.1	78.5	52	-2
700	56.7	74.2	55	-2
800	60.3	67.8	58	-2
900	63.9	61.1	62	-2
1000	66.6	55.8	65	-1.5
1100	68.7	52.1	68	-1
1200	70.2	49.7	69	-1
1300	71.0	48.1	70	-1
1400	71.4	47.8	70	-1
1500	70.9	48.6	70	-1
1600	69.2	51.2	68	-1
1700	66.4	56.1	64	-2.5
1800	63.4	61.9	61	-2
1900	60.8	66.9	59	-2
2000	59.1	70.2	57	-2
2100	57.9	72.7	56	-2
2200	56.8	74.6	55	-2
2300	56.0	75.9	54	-2.5

months, relative temperatures should be adequate, and the months that are identified using this process are the same ones that would be logically identified by readers familiar with California's weather patterns.

Reduced air conditioner use during shoulder months results in an additional benefit available beyond that calculated for reduced compressor power needs.[14] Staff used temperatures during the evening rush hour (5 to 6 pm) to determine that, for California as a whole, four of twelve months are shoulder months. This fraction was multiplied by the calculated benefits from Table B-3 (.33 x 0.86 MMT CO_2) to arrive at an additional 0.29 MMT CO_2 per year during these shoulder months. Adding this number to the 0.86 MMT estimated previously results in a total of 1.15 MMT CO_2 per year benefit in 2040. In addition, the improved solar control may result in very short soaks that may not heat up the vehicle sufficiently to require the use of the air conditioner. These potential benefits have not been quantified.

3. Out-Migration

There are further benefits that can be quantified. EMFAC includes attrition rates for the vehicle fleet. Some attrition is due to vehicle scrappage, and some to vehicles relocating to other states. The C02 emissions benefit for those migrating vehicles will continue to accrue even though the vehicle has relocated out of state. EMFAC does not provide a break-out of scrappage versus attrition. However, approximately 300,000 people leave the state each year (COOF, 2007). Staff estimates that these people took 200,000 vehicles with them. By 2040, it would be expected that all the departing vehicles will comply with the proposed standards. Therefore, staff has estimated the CO_2 benefit for the remaining useful life of these vehicles. Median vehicle age is 9 years, with an expected useful life of 12 years for the air conditioner system. Assuming that older vehicles are sold, and newer vehicles are retained, staff estimates that the average age of a vehicle migrating to another state is 5 years; based on EMFAC projections, a 5 year old vehicle would have approximately 48,000 miles on the odometer. Assuming an air conditioner useful life of 120,000 miles, benefits will accrue for an additional 72,000 miles. These additional benefits are not included in California projections as the vehicles have been removed from the California inventory. Staff estimates that the 200,000 vehicles estimated to migrate annually would provide an additional annual benefit of 0.03 MMT CO_2. This figure was derived by multiplying the annual number of migrating vehicles times ,the remaining mileage and entering the resulting vehicle miles per year into the model previously presented in Table B-3.

4. Nationwide Benefits

There are additional potential benefits that can be estimated. When faced with California regulations, manufacturers can choose to make California cars, or, if the costs are less than the cost of doing that, make all US vehicles comply with the California requirements. In this case, estimated direct costs for tier 1 (2012)

[14] An air conditioner with a smaller compressor is smaller and more efficient, but if it is not used at all, the benefit is even greater.

requirements to the manufacturer are $35 for the solar reflective windshield, and up to $25 per carset (average $11) for the sidelites and backlite. Manufacturers have told staff that it costs $2-3 per piece to put destination-specific components into a vehicle. This means that for a typical vehicle, it may be more cost-effective for the manufacturer to use the same sidelites and backlite for the vehicle regardless of its final U.S. destination. Therefore, benefits that accrue from these glazing positions will accrue in other states as well. Using the aforementioned model, including AB 1493 and uncertainty adjustments, and assuming the same fleet mix as in California, as well as national average air conditioner use rates of 28 percent and national vehicle population and VMT estimates, projected benefits for the rest of the nation are estimated at 1.96 MMT CO_2 nationwide. If manufacturers chose to market a 50-state car, projected benefits are increased to 8.30 MMT C02.

These benefits are summarized in Table B-5. Summing all the quantified C02 benefits from this proposed regulation could result in up to 9.5 MMT C02 reduced annually nationwide, although a benefit at the lower end of the range is more likely.

Table B- 5. Overall CO_2 Benefits, 2040.

	MMT CO_2 per year
Reduced Compressor Need	0.86
Shoulder Months	0.29
Out-Migration	0.03
Nationwide	1.96 to 8.30
Total- California Only	1.18
Total- Nationwide	3.14 to 9.48

III. Alternate Regulatory Scenarios

Staff assessed a variety of regulatory options, including requirements for solar reflective windshield only, all-around solar reflective glazing, all-around solar management glazing, and the specific phase-in proposal for solar management glazing proposed by the Alliance of Automobile Manufacturers (the Alliance). Assuming full implementation, the comparisons can be made using the same modeling approach as discussed above. All that needs to change is the estimated soak temperature reductions. However, phase-in schedules will significantly affect the benefits that accrue in 2020. This section will describe the method used to assess a sample of the regulatory options investigated by staff. It includes the benefits available from reduced compressor requirements, as well as from reduced air conditioner use during shoulder months, but does not include the benefits from vehicles that have migrated out of California nor the available benefits from the potential use of solar management glazing nationwide. Therefore, the benefits presented in the tables in this section should be considered on a relative basis only, rather than as actual benefits under any given scenario.

As mentioned above, the scenarios examined may have different phase-in schedules, as well as different final goals. To determine the emission benefit from each scenario, staff obtained EMFAC-projected VMT and vehicle registration data for 2012 through 2040 model-year vehicles less than or equal to 10,000 pounds gross vehicle weight rating. The benefits were calculated relative to the 1.15 MMT CO_2 per year expected in 2040 from implementation of the proposed regulation in California (excluding out-migration). The same assumptions were used as indicated in section A above (see pages 8-5 and 8-6), adjusted for the scenario - all-around glazing with a total solar transmission of 50 percent reduces the interior soak temperature by *BOC*; all-around glazing with a'total solar transmission of 60 percent reduces the interior soak temperature by 6°C; and so on. As an example of the process, if the alternate proposal was for all-around glazing with a total solar transmission of 50 percent, with the windshield in 2012 and the balance in 2013, the 2012 emission benefit would be calculated from the VMT of 2012 model year affected vehicles at 50 percent (windshield only) of the total *BOC* benefit from using this product in all glazing positions. In 2013, the benefit would be calculated from the VMT from the remaining 2012 model year vehicles at that control level (some would have been retired or left the state), plus the VMT of 2013 model year affected vehicles at 100 percent of the total *BOC* benefit from using this product in all glazing positions. In 2014, the 2014 VMT from 2012 model year vehicles at 50 percent control are added to the 2014VMT from 2013 and 2014 model year vehicles at 100 percent control. This process continues through 2020, the year for which A8 32 has a specified emission reduction goal, and then through 2040, the last year to which EMFAC projections currently extend.

For lengthy phase-in alternatives, 2040 projections may fall substantially short of full implementation. For instance, the Alliance proposal phase-in continues through the 2017 model year. There is still a significant portion of the 2040 fleet with functioning air conditioners that does not have full solar control. The projections in the Staff Report for an all-around total solar transmission of 60 percent, as proposed by the Alliance, will be close to full implementation.

Staff reports the anticipated benefits for the six proposals which are presented. in Table 8-6. The anticipated relative benefits for these proposals are presented in Table 8-7. The difference in the benefit seen for staff's proposal in 2040 in this table compared to that in Table 8-5 results from the fact that full implementation is not actually achieved by 2040. The benefits in 2040 presented previously assume that full implementation occurred by that time. In addition, these relative benefits do not include benefits from vehicles that have left the state.

Staff's proposal is similar to the Alliance proposal in that both call for a total solar transmission limit of 60% for most of the vehicle glazing. Staff's proposal, however, has a significantly shorter phase-in period; requires the' use of better performing glazing on the rooflite, and on the windshield. Improved windshield performance is readily achievable because the laminated windshield can use solar refleotive materials to improve solar performance. The improved windshield, together with the increased level of solar control for the rooflites in Staff's proposal, results in over forty

Table B- 6. Alternate Scenarios.

		Windshield	Sidelites	Backlite	Rooflite
A	Regulatory Proposal (phase-in for 2012 rqmt)	75% 2012 @ Tts 50% 100% 2013 @ Tts 50% 100% 2014 @ Tts 40%	100% 2012 @Tts60%	100% 2012 @. Tts'60%	100% 2012 @ Tts 30%
B	Reg. Proposal w/o phase-in	100% 2012 @ Tts 50% 100% 2014 @ Tts 40%	100% 2012 @Tts60%	100% 2012 @ Tts 60%	100% 2012 @ Tts 30%
C	All-Around 40%	100% 2012 @ Tts 40%	100% 2012 @Tts40%	100% 2012 @ Tts 40%	100% 2012 @ Tts 30%
D	All-Around 50%	100% 2012 @ Tts 50%	100% 2012 @Tts50%	100% 2012 @ Tts 50%	100% 2012 @ Tts 40%
E	All-Around 60%	100% 2012 @ Tts 60%	100% 2012 @Tts 50%	100% 2012 @ Tts 50%	100% 2012 @ Tts 40%
F	Alliance Proposal	25% 2012 @ Tts 60% 50% 2013 @ Tts 60% 75% 2013 @ Tts 60% 100% 2013 @ Tts 60%	- - 25% 2012 @ Tts 60% 50% 2013 @ Tts 60% 75% 2013 @ Tts 60% 100% 2013 @Tts60%	25% 2012 @ Tts 60% 50% 2013@ Tts 60% 75% 2013@ Tts 60% 100% 2013@ Tts 60%	 25% 2012 @ Tts 60% 50% 2013@ Tts 60% 75% 2013@ Tts 60% 100% 2013@ Tts 60%

Table B- 7. Benefits of Regulatory Alternatives in 2020 and 2040 (MMT CO_2).

	Alternative	Emissions Reduction 2020	2040
B	Staff's Proposal w/o phase-in	0.685	1.12
C	Tts < 40%	0.783	1.28
D	Tts < 50%	0.623	1.01
E	Tts < 60% w/o phase-in	0.556	0.90
F	Alliance Proposal	0.386	0.75
A	Staff's Proposal Tts < 40%, < 60%	0.678	1.12

percent greater emission reductions in 2020, and over 30 percent greater benefit by 2040.

IV. Reductions in Criteria Pollutants

Reducing the fuel used for air conditioning will also result in reductions in emissions of criteria pollutants such as oxides of nitrogen, reactive organic gases, and carbon monoxide. Table B-8 presents staff's estimates of the associated reductions. The estimates are based on EMFAC output of the effect of air conditioner use on criteria pollutants, adjusted for the air conditioner use rate, effect on fuel efficiency and greenhouse gas emissions as presented herein, and by the ratio of baseline air conditioner-related fuel use to adjusted fuel use. EMFACis air conditioner-related emissions were multiplied by (0.29/0.10) to adjust for the air conditioner use rate, by (0.26/0.11) to adjust for the effect on fuel efficiency to provide baseline air conditioner-related emissions, which are then multiplied by the estimated 16% reduction in air conditioner related fuel use resulting from this proposal. Results are presented in Table B-8.

Table B- 8. Associated Reductions in Criteria Pollutants, 2040

Criteria Pollutant	Tons per year
Reactive Organic Gases	106
Carbon Monoxide	12,696
Oxides of Nitrogen	297

Carbon monoxide is also a greenhouse gas, with a greenhouse warming potential of around 1.9. Staff converted the projected reductions in carbon monoxide to an equivalent 0.02 MMT CO_2 per year. This can be added to the projected CO_2 benefits.

V. References

ARB (California Air Resources Board). 2004. Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles. August 6,2004. Page 75, Table 5.2-12.

CAVTC (Clean Air Vehicle Technology Center). 1999. Final Report, CRC Project E-37. Effect of Air Conditioning on Regulated Emissions for In-Use Vehicles. Phase I.

CDOF (State of California, Department of Finance). 2007. They Moved and Went Where: California's Migration Flow, 1995-?000: Sacramento, California. June 2007.

Chaney, L, K Thundiyil, S Chidambaram, 2007. Fuel Savings and Emission Reductions from Next-Generation Mobile Air Conditioning Technology in India.

Presented at the Vehicle Thermal Management Systems Conference & Exhibition (VTMS-8), Nottingham, England. May 20-24,2007. NRELICP-540-41154.

EPA, Office of Transportation and Air Quality. 2006. Fuel Economy Labeling of Motor Vehicle Revisions to Improve Calculation of Fuel Economy Estimates. Final Technical Support Document. EPA420-R-06-017. December 2006.

Farrington, R, J Rugh, G Barber. 2000. Effect of Solar-Reflective Glazing on Fuel Economy, Tailpipe Emissions, and Thermal Comfort. SAE Paper No. 2000-01-2694.

Gravel, R, R Farrington. 2001. Innovative climate control technologies boost vehicle economy, decrease emissions. http://www1.eere.energy.gov/vehiclesandfuels/pdfs/successlva13_23_01.pdf

Johnson, V. 2002. Fuel Used for Vehicle Air Conditioning: A State-by-State Thermal Comfort-Based Approach. SAE Paper No. 2002-01-1957.

NSCCAF (Northeast States Center for a Clean Air Future). Reducing Greenhouse . Gas Emissions from Light-Duty Motor Vehicles. September 2004. Appendix D is an analysis by Meszler Engineering Services to determine the benefits from a variety of air conditioner systems.

Peter, J. 2004. The Sky's the Limit. *Automotive Industries:* July 2004.

Rugh, J. 2008. Personal communication.

Rugh, J, V Hovland, SAnderson. 2004. Significant Fuel Savings and Emission Reductions by Improving Vehicle Air Conditioners. 15th Annual Earth Technologies Forum and Mobile Air Conditioning Summit, Washington DC. April 14-15,2004.

Rugh, JP, L Chaney, J Lustbader, 2007. Reduction in Vehicle Temperatures and Fuel Use from Cabin Ventilation, Solar-Reflective Paint, anda New Solar-Reflective Glazing. SAE Paper No. 2007-01-1194.

Rugh, JP, T Hendricks, K Koram. 2001. Effect of solar reflective glazing on Ford Explorer climate control, fuel economy, and emissions. SAE Paper No. 2001-01-3077.

SFTP (Supplemental Federal Test Procedure), 1996. Data generated to support California Air Resources Board's Public Hearing to Consider Adopticm of New Certification Tests and Standards to Control Exhaust Emissions from Aggressive Driving and Air-Conditioner Usage for Passenger Cars, Light-Duty Trucks and Medium Duty Vehicles under 8,501 Pounds Gross Vehicle Weight Rating.

Table B- 9. Average Temperature Profiles for California

Time	January	February	March	April	May	June	JUly	August	September	October	November	December
	Temperatures (OF)											
0000	46.6	48.6	50.7	54.2	57.0	60.7	63.7	64.3	62.3	58.8	51.2	45.3
0100	45.6	48.0	50.0	53.6	56.4	59.8	63.1	63.4	61.6	58.2	50.4	44.6
0200	44.8	47.8	49.3	53.0	55.7	59.2	62.7	63.0	61.2	57.5	49.6	43.8
0300	43.4	46.8	48.7	52.4	55.4	58.9	62.7	63.0	60.9	56.8	48.5	42.6
0400	43.5	47.2	48.7	52.1	54.9	58.3	61.8	62.1	60.0	56.8	48.9	43.1
0500	43.7	46.8	48.4	51.9	55.1	58.9	62.0	61.8	60.0	56.6	48.6	42.9
0600	43.7	46.9	48.9	54.0	57.9	61.9	64.1	63.5	60.9	57.3	48.8	43.1
0700	44.0	47.9	51.3	58.0	61.2	65.4	67.3	67.3	65.0	60.2	50.6	44.0
0800	47.0	51.3	54.7	62.0	64.3	68.5	70.5	71.0	69.4	64.7	55.0	47.0
0900	50.6	54.9	57.7	65.0	66.9	71.4	73.6	74.5	73.2	68.7	59.5	51.1
1000	53.3	57.2	59.9	67.3	69.0	73.7	76.2	77.3	76.3	71.5	62.9	54.4
1100	55.9	59.2	61.4	68.9	70.9	75.8	78.2	79.5	78.6	74.0	65.4	56.8
1200	57.0	60.7	62.6	70.2	72.3	77.1	79.9	81.2	80.5	75.4	67.0	58.4
1300	57.6	61.1	63.1	70.9	73.0	78.1	81.0	82.5	81.6	76.1	67.5	59.1
1400	57.7	63.0	63.4	71.3	73.1	78.2	81.5	82.8	81.8	76.0	67.5	59.2
1500	57.4	62.7	63.1	70.9	72.7	77.9	81.1	82.4	81.3	75.0	66.5	58.5
1600.	56.8	60.3	62.1	69.5	71.2	76.6	80.0	80.7	79.6	72.4	63.6	55.9
1700	53.8	57.7	60.0	67.2	69.2	74.8	78.0	78.2	76.2	68.7	59.5	52.3
1800	51.6	55.1	57.2	63.8	66.3	71.9	74.8	74.5	71.7	65.3	56.8	50.3
1900	50.1	53.4	55.1	60.7	63.2	68.2	70.9	70.7	68.5	63.3	55.4	49.2
2000	49:3	52.3	53.9	58.9	61.2	65.5	68.3	68.6	66.6	62.0	54.2	48.1
2100	48.6	51.6	53.0	57.6	59.8	63.8	66.5	67.0	65.2	60.9	53.3	47.4
2200	47.9	50.5	52.2	56.3	58.7	62.4	65.2	65.7	63.9	60.0	52.6	46.7
2300	47.8	49.4	51.4	55.3	57.9	61.4	64.3	64.8	63.2	59.2	51.9	46.1

State of California
AIR RESOURCES BOARD

Appendix C

Additional Information

Cool Car Standards and Test Procedures

Date of Release: **May 8, 2009**

Appendix C

ADDITIONAL INFORMATION IN SUPPORT OF PROPOSED COOL CAR STANDARDS AND TEST PROCEDURES

Air conditioners and air conditioner use increases greenhouse gas emissions. Recognition of the benefits of reducing the air conditioner load was previously acknowledged by the California Air Resources Board (ARB) in its Assembly Bill 1493 regulation. Staff is proposing a regulation that will reduce the air conditioner load in light- and medium-duty vehicles. This document provides additional information to support that contained in the Staff Report.

l. SOLAR REFLECTIVE PAINT

As originally envisioned, the proposed regulation focused on solar reflective paints, with solar management glazing added to the proposal during the regulatory development process. However, the final proposal does not include solar reflective paint. Although staff believes that these paints should be developed and used, the timeframe of this regulation is too short to ensure that pigments for all desired colors can be developed. This is because developing new colors or new paints is a time-consuming process. New color development begins with color shows, where the automotive stylists discuss their desired color options with the paint manufacturers, who then put together their offerings. Color masters are developed and released to all suppliers for matching. Engineering evaluations of the color masters, including a two-year Florida weathering test, chip resistance, humidity resistance, intercoat· adhesion, windshield adhesion, etc. are completed, followed by an application simulation for each plant. After in-plant line trials, the production launch and ramp-up begins. This is a long process. Generally, assuming pigments have been verified for automotive use, it takes around five years from color selection to application on a vehicle for sale.

This five year process assumes that the pigments used in the paints are verified for automotive use. The automotive paint requirements are rigorous, and many new pigments may not prove to have acceptable performance. Pigment verification can take an additional 1-2 years. It is uncertain whether any of the very dark pigments with higher reflectivity developed to date are suitable for automotive use. Pigments currently in the verification process are unable to generate a true "jet black". They tend to have brown or blue undertones resulting in a somewhat "muddy" appearance that may not be visually appealing. However, staff is aware of some pigments being developed now that may overcome this issue.

II. SOLAR CONTROL GLAZING

Solar control window glazing includes solar reflective glazing and solar absorbing glazing. Solar reflective glazing is produced by a number of glass companies. Most solar reflective glazing involves the use of silver oxides, but non-metallic products are also available. Although there are solar reflective films that can be applied to the exposed glass surfaces, weatherability and durability may be an issue. Therefore, use of solar reflective glazing will generally require laminated glass. The solar reflective glazing available has significant benefits in terms of solar control compared to the best solar absorbing glazing currently available. The five percent of vehicles that currently have laminated glass are well-positioned to utilize solar reflective glazing.

Solar absorbing glazing is made by adding solar absorbing components to the molten glass. Most solar control in the United States is currently achieved with solar absorbing glazing. In Europe, solar reflective glazing has greater acceptance.

A. Effect of Solar Control Glazing on Vehicle Interior Temperatures

How much temperature reduction is possible with the use of solar control glazing? The National Renewable Energy Laboratory (NREL) and other institutions have investigated the effectiveness of various solar control products. Typical research results are summarized in Table C-1. The upper bound of potential control can be determined by efforts such as those at the Fiat Research Center, where shielding vehicle glazing with aluminum film resulted in cabin air temperature reductions of up to 20°C.[1] Similar NREL tests resulted in breath air temperatures only 1DOC above ambient.[2] (Breath air temperature is the air temperature at the location of a typical driver's face.) Although the foil would allow some heat transfer, these reductions are likely near the theoretical maximum. A more practical glazing application, however, would require the transmittance of at least some visible light even for privacy glazing.

Currently available solar managem'ent products have been tested and the results reported in the literature. Typical research results are reported in this section. NREL tested 3M polymeric solar reflective film (nonmetallic) on identical minivans, finding a 4.6°C reduction in maximum breath temperature with the use of the 3M glazing on all windows, while modifying only the windshield reduced the breath temperature by 2.5°C.[3] This is consistent with indications that about half the solar radiation enters the vehicle through the windshield (for vehicles without rooflites). The nonmetallic films are generally not as effective as metal-based products, but do not have issues with electromagnetic attenuation. The 4.6°C temperature reduction was associated with a reduction in time to 25°C by 3.75 minutes, from about 20 minutes to 16.25 minutes. Thi.s means that the' air conditioning system could operate at a reduced energy level with use of the film and provide the same comfort level. To cool at the same rate as the vehicle with production glazing, a v.ehicle using this film would require an air conditioner with about 19% less power.[4]

Southwall Technology's XIR® film was tested on a luxury sedan. Interior temperatures were reduced by 1DOC when the vehicle was equipped with XIR film

compared to the standard solar tint glass. In addition, subjective passenger feedback indicated a reduction of 25% in "time to comfort" --16 minutes in the XIR vehicle compared to 21 minutes for the control.[5]

Pittsburgh Glass Works' Sungate solar reflective glass was tested in two identical white Ford Explorers, one with production glazing and the other with modified glazing. Use of Sungate glazing in the windshield resulted in temperature reductions of 2.2°C.[6] The relatively modest result is likely due to the fact that the production windshield used solar absorbing glass. Thus, this is actually a comparison of solar absorbing to solar reflective glazing; and is consistent with other published and nonpublished results indicating a difference of around 2°C for the two solar control approaches. For example, Fiat completed a 2-hour soak testing of a Punto, which showed internal air temperatures of 65°C for standard glazing, compared to 60°C for absorbing, and 58°C for infrared reflective glazing. This shows a 2°C difference in soak temperature between a solar reflective and a solar absorbing glazing.[7]

Sungate was also tested in a Plymouth Breeze. In this test, NREL examined the effect of a Sungate windshield compared to Solex (U.S. standard), and Solar Green (European standard). With the Sungate windshield, the cabin was goC cooler than with standard windows under the existing test conditions. The Sungate windshield permits a compressor reduction of about 400 watts, which could reduce fuel use by 3.4 percent (0.7 miles per gallon) over the SC03 cycle, according to NREL's ADVISOR simulations.[8]

In 2006, NREL tested solar reflective paint and glazing on a Cadillac STS.[9] This glazing was PGW's improved SUilgate EP, which has been fully developed but is not currently in production. Solar reflective glass (all locations) and solar-reflective paint resulted in a reduced breath air temperature of 9.7°C. Solar reflective glass on the windshield only resulted in reduced breath air temperature of 6.7°C. The paint and glazing were not assessed separately, but the solar reflective paint was only slightly more reflective than the standard paint (18% reflectivity compared to 11% for the standard paint). Based on Hoke's analysis, staff estimates that about 0.7°C of the benefit would be derived from this level of solar control for the paint.[10]

Table C-1 summarizes these data, and shows an average breath air temperature reduction of *6AoC,* with a range of 1.8°C to 10°C.

B. Costs of Solar Control Glazing

1. Glazing Costs

Current glazing ranges from clear glass (Le., no solar control) for inexpensive vehicles to all-around solar reflective glazing on more expensive European models. The proposed regulation does not require the use of solar reflective glazing. An earlier draft proposal included the use of all-around solar reflective glazing· requirements. While the benefits to be obtained from this approach were greater than those from the proposed regulation, as discussed in the Staff Report, the use of all-around solar reflective glazing would substantially increase the cost of the

Table C- 1. Summary of typical research on solar reflective paints and coatings.

Source	Vehicle type	Treatment	Breath air temp red'n
NREL"		Aluminum foil	10°C (18 F)
Fiat[12]	Punto	Aluminum film	20°C
Fiat[13]	Punto	SRFilm	7°C
NREL[14]	minivan	3M nonmetallic	4.6°C
NREL[15]	Luxury sedan	XIR	10°C
NREL[16]	Plymouth Breeze	Sunaate	goC
NREL[1f]	Ford Explorer	Sunaate	2.7°C
NREL[18]	Cadillac STS	Suriaate EP	9.7°C*

*Note that the test vehIcle also Included a slightly more reflectIve paint than the control vehicle (0.18 versus 0.11), which was not independently assessed.

proposal, as windows not currently laminated would need to be upgraded. Most vehicle manufacturers indicated a 5-fold increase in cost from tempered glazing to solar reflective laminated glazing. At the May 15, 2008 workshop, General Motors indicated that laminated glass would cost an additional $45-50 per piece of glass. Glass manufacturers have put the cost estimate significantly lower, around a 1.5 to 2-fold increase, or, around $150-300 for the entire vehicle. This is still a significant investment. Glass manufacturers have estimated direct cost increases from laminated to solar reflective laminated of around $1.50 per square foot; for glass not currently laminated, the cost is higher, at around $2.50 per square foot, to go from current tempered glass to solar reflective laminated glass.[a] These costs are based on a five percent penetration rate, and may be expected to decline with higher volumes.

Concern about these costs led staff to assess the potential benefits from allowing solar absorbing glazing on some window positions. Solar absorbing glazing generally has a small cost premium over current light-tinted glass, ranging from $0 to $25 for all the vehicle's sidelites and backlite. This direct cost will be the cost to move from the current level of solar control (none, light green tinting, solar absorbing glazing) to a glazing that transmits no more than 60 percent of the total solar energy. Based on staff's assessments of the current level of solar control in sidelites and backlites, staff determined that direct costs for sidelites and backlites wiil increase by around $11 for the typical vehicle. Rooflites currently use some level of solar control for the comfort of the passengers. Staff estimates an increased direct cost for rooflites of $7, based on the average size and solar performance of current rooflites.

To meet the proposed windshield requirements with current technology, a solar reflective approach is likely. While solar reflective glazing generally requires the use

[a] One glass manufacturer provided specific estimates of the cost to move from a laminated to a solar reflective laminated windshield. The solar reflective product was projected to cost around $25 for the typical windshield. Going from current tempered glazing to laminated solar reflective glazing was projected to cost $26 for a backlite, $105 for the 4 door glass panes, and another $52 for the quarter panels, for a total for all-around solar reflective laminated glazing of $208.

of laminated glass, all windshields currently use laminated glass. Thus, the direct cost for a solar reflective windshield would only reflect the additional cost of the film or coating. For a windshield, which has a large surface area, the direct incremental cost between the current laminated windshield and a solar reflective model is around $25 to $35, when customer options are considered. Higher levels of solar control tend to be slightly more expensive.

In these direct cost estimates, staff has considered anticipated cost increases suggested by both glazing and vehicle manufacturers. For the first tier (2012) windshield requirement,direct cost estimates provided to staff range from $15 to $110 over current glazing, with the typical estimated direct cost of around $35. Staff used the typical cost of $35 for our analyses.[b] For the second tier (2014), anticipated cost increases provided by glazing manufacturers indicate an additional $10 to $15 would be expected, for a total increased direct cost from today's baseline direct cost of up to $50 for the windshield. Depending on current control levels, cost increases for the other glazing ranges from $0 to $33, with an anticipated average cost of $18 per vehicle. This results in a total direct cost to the vehicle manufacturer of $68 ($50+$18) for the tier 2 (2014) requirements.

This $68 estimated direct cost increase forthe solar management glazing reflects the costs that the glass suppliers charge the automobile manufacturers. But there are also indirect costs that the automobile manufacturers may encounter. The automotive industry applies scaling factors to predict the full impact vehicle modifications have on the selling price. A commonly used scaling factor is the retail price equivalent (RPE) multiplier. This RPE multiplier includes both direct and indirect costs. In a recent EPA report,t9 an indirect cost multiplier which specifically evaluates the components of indirect costs likely to be affected by vehicle modifications associated with environmental regulation was developed. A range of multipliers accounts for the differences in the technical complexity of the change, and adjusts over time as new technology becomes assimilated into the automotive production process: The underlying concept is that regulations requiring major changes in materials or manufacturing processes, or significant invention of new technology, will likely have a significant impact on indirect costs. In contrast, regulations requiring simple technology modifications may have negligible impacts on indirect costs.

The EPA report presents three multipliers, based on the level of complexity of the suggested change. A change to a hybrid electric vehicle would have high complexity. A transmission change might be a medium level of complexity, because associated components might need modification to properly mesh with the new component. A change to low rolling resistance tires would have a low technical complexity.

Staff believes that the sidelite, backlite, and rooflite requirements in this regulation are low complexity changes. Staff anticipates that they will introduce only minor changes to existing glazing.- However, if compliance with the windshield requirements leads to

[b] The estimated cost includes the costs for "deletion areas" in reflective coated windshields to allow the proper operation of electronic devices such as cellular telephones and global positioning systems.

the use of metallic materials that result in electromagnetic attenuation, other associated components might need to be addressed, such as the positioning of antennae and the creation of deletion areas. Therefore, staff proposes the use of a medium complexity multiplier for the windshield, and a low complexity multiplier for the balance of glazing. The low complexity multiplier suggested in the EPA analysis is 1.05 in the short term, and 1.02 in the long term. The medium complexity multiplier suggested in the EPA analysis is 1.2 for the short term, declining to 1.05 in the long term. Applying these multipliers increases the long-term cost assessment for compliant glazing at the tier 2 (2014) level to $52.50 for the windshield, and $18.36 for the balance of glazing, for a total adjusted cost to the consumer of around $71. This adjusted cost is used in the cost-effectiveness calculations.

2. Effect of State Revenues

The CO_2 benefit in this proposed regulation is due to reduced fuel use. Therefore, vehicles built to comply with the regulation, i.e., 2012 and subsequent model-year vehicles, would use less fuel. This will result in reduced state and local government revenue from the excise tax and sales tax on motor vehicle fuel. The regulation is expected to result in a reduction in fuel use of 161 M gallons per year with full implementation. This reduced fuel use will result in a reduction in the excise tax and sales tax collected for motor vehicle fuel of $29M (assuming these taxes total $0.18/gallon). The loss will be offset by increased sales tax for the vehicles. At a rate of 8%, the increased sales tax would total around $12M annually at full implementation. This net revenue loss of around $17M annually at full implementation is not included in the cost-savings calculations.

III. ISSUES

Vehicles with no air conditioner. ARB was asked to consider exempting vehicles without air conditioner from these regulations. Staff has not proposed doing so, because of concerns about aftermarket addition of air conditioning, practicalities of manufacturing and enforcement, and because we believe there will be a small emissions benefit even for vehicles without air conditioners in that if the interior temperature is less hot, the occupant will be less likely to keep the windows down, and therefore the vehicle will be operated in a more aerodynamic manner. We believe that the increase in cost will be acceptable to the consumer for the benefit of cooler interiors.

Electromagnetic attenuation. Current solar reflective glazing does tend to reduce the strength of electromagnetic signals used by devices such as global positioning systems, toll passes, garage door openers, and various sensors. Staff believes that since all-around solar reflective glazing is not required in this proposal, most sensors and antennae can be placed in positions where signal strength will be adequate. Nonetheless, the regulatory proposal allows the use of deletion windows where needed, so staff does not believe that electromagnetic attenuation will be a problem.

Test Procedures. Concerns have been raised about the use of the specified test procedure, International Standards Organization's (ISO) 13837, primarily as relates to

the fixed convective coefficients and secondary heat generation from absorption, and their relationship to calculation of total solar transmission. It is argued that the coefficients underestimate the secondary heat flow for dark privacy glazing and overestimate the conductive gain for reflective glazing, providing the appearance that privacy glazing performs better than reflective glazing, even though in the real world, this is not the case, because it assumes all glass is "ordinary" wlth an emissivity of 0.837. An alternative methodology might be ISO 15099, which is much more accurate, but is very complicated. While staff acknowledges this issue, staff believes that the additional complexity of ISO 15099 does not merit its use, given that ISO 13837 is a much more commonly used procedure.

It has also been suggested that the total solar transmission should be measured at a "more typical" angle between the sun and the glass than the normal incidence called for in ISO 13837. Some solar management materials may be particularly sensitive to the measurement angle. T.he concern is that these materials may not appear to meet the required total solar transmission requirements but in actual use, their performance may be equivaient to materials that do comply with the proposed limits. Staff has addressed this issue by allowing a request to be made to the Executive Officer to allow alternate test procedures so long as use of the proposed glazing results in equivalent solar control to that anticipated under the proposed glazing requirements, as demonstrated by the assessment of real-world temperature measurements on a variety of vehicles under outdoor test procedures such as those typically used by NREL.

1 Lugara, E. Fiat Research Centre, Italy. Envelope optimisation (colour, roof insulation, advanced glazing), an overview. Presented at the 23-24 Oct 2006 International Energy Agency, Paris, Meeting entitled Cooling Cars with Less Fuel: Improving the On-Road Performance of Motor Vehicles.
2 Rugh, J, R Farrington, J Boettcher. 2001. The Impact ot-Metal-Free Solar Reflective Film on Vehicle Climate Control. SAE Paper No. 2001-01-1721.
3 Rugh et al. Op Cit. SAE Paper No. 2001-01-1721.
4 Rugh et al. Op Cit. SAE PaperNo. 2001-01-1721.
5 www.prnewswire.com. Visteon press release, May 24, 2001. Visteon, Southwall, and the US Department of Energy's National Renewable Energy Laboratory Announce Favorable Test Results of XIR® Solar Reflective Film in Automotive Glazing.
6 Rugh, J, T Hendri.cks, K Koram. Effect of Solar Reflective GlaZing on Ford Explorer Climate Control, Fuel Economy, and Emissions. SAE 2001-01-3077.
7 Lugara, E. 2006. Op Cit.
8 Farrington, R, J Rugh, G Barber. Effect of Solar-Reflective Glazing, fuel economy, tailpipe emissions, and thermal comfort. SAE Paper No. 2000-01-2694.
9 Rugh, J, L Chaney, J Lustbader, J Meyer, M Rustagi, K Olson, R Kogler, Reduction in Vehicle Temperatures and Fuel Use from Cabin Ventilation, Solar-Reflective Paint, and a New Solar-Reflective GlaZing. SAE Paper No. 2007-01-1194.
10 Hoke, P, C Greiner. Vehicle Paint Radiation Properties and Affect on Vehicle Soak Temperature, Climate Control System Load, and Fuel Economy. SAE Paper No. 2005-01-1880.
11 Rugh et al. Op. Cit. SAE Paper No. 2001-01-1721.
12 Lugara, E. 2006. Op. Cit.
13 Lugara, E. 2006. Op Cit.
14 Rugh et al. Op. Cit. SAE Paper No. 2001-01-1721:
15 Visteon press release. 2001. Op. Cit.
16 Farrington et al. Op Cit. SAE Paper No. 2000-01-2694.
17 Rugh et al. Op. Cit. SAE Paper No. 200.1-01-3077.
18 Rugh et al. Op. Cit. SAE Paper No. 2007-01-1194.

[19] EPA, 2009. Automobile Industry Retail Price Equivalent and Indirect Cost Multipliers. Prepared for EPA by RTI International and Transportation Research Institute, University of Michigan. EPA-420-R-09-003. February 2009.

TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF A PROPOSED AB 32 COST OF IMPLEMENTATION FEE REGULATION AND PROPOSED AMENDMENT TO THE EXISTING REGULATION FOR THE MANDATORY REPORTING OF GHG EMISSIONS

The Air Resources Board (ARB or the Board) will conduct a public hearing at the time and place noted below to consider the adoption of a new regulation to impose fees on sources of GHG emissions to carry out Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006, and to consider the adoption of an amendment to the existing Regulation for the Mandatory Reporting of GHG Emissions.

DATE: June 25-26, 2009

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 25,2009, and may continue at 8:30 a.m., June 26,2009. This item may not be considered until June 26,2009. Please consult the agenda for the meeting, which will be available at least 10 days before June 25, 2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by fax at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. TTYITDD/Speech to Speech users may dial 711 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected:

Proposed adoption of California Code of Regulations, title 17, new article 3, sections 95200,95201,95202,95203,95204,95205,' 95206, and 95207.
Proposed amendment to California Code of Regulations, title 17, article 2, section 95104.

Background:

AS 32 Cost of Implementation

Governor Schwarzenegger signed the California Global Warming Solutions Act of 2006 (AB 32) on September 27,2006. When the Legislature adopted AB 32, it declared that global warming poses a serious threat to the economic well-being, public health, natural resources, and the environmentof.California. AB 32 directed ARB to establish a statewide greenhouse gas (GHG) emissions limit for 2020 based on 1990 emissions.

AB 32 directs the Board to carry out specific tasks related to reducing GHG emissions. These tasks include monitoring GHG emissions, implementing a program of annual reporting of GHG emissions from GHG emission sources, and accounting for all GHG emissions, including emissions from. all electricity generated in California or imported from other states, providing reporting tools for such data, and ensuring the sources of GHG emissions maintain records of GHG emissions.

AB 32 also specifically directed ARB to adopt a Scoping Plan by January 1, 2009, that shows how emission reductions will be achieved from significant GHG sources via regulations, market mechanisms, and other actions.

ARB's approved Climate Change Scoping Plan identifies the proposed regulation as necessary to carry out AB 32.. ARB and other State agencies are developing and implementing regulations and other programs to carry out the Scoping Plan. The Scoping Plan states:

> Administration, implementation, and enforcement of the emissions reduction measures contained in the Proposed Scoping Plan will require a stable and continuing source of funding. AB 32 authorizes ARB to collect fees to fund implementation of the statute. This fall ARB will initiate a rulemaking for a fee program to fund administration of the program. (Scoping Plan, page 112.)

AB 32 authorizes ARB, through Health and Safety Code section 38597, to adopt a schedule of fees to be paid by sources of GHG emissions to support the costs of carrying out AB 32. ARB staff is proposing this regulation pursuant to section 38597.

GHG Mandatory Reporting Tool

ARB's Regulation for the Mandatory Reporting of GHG Emissions is set forth in California Code of Regulations, title 17, sections 95100-95133, and became effective January 2, 2009. The regulation requires specified sources of GHG emissions to report those emissions to ARB every year beginning in 2009. The reporting of GHG emissions is required by operators of cement plants, petroleum refineries, hydrogen plants, electricity generating facilities, cogeneration facilities, electricity retail providers and marketers, and other industrial facilities emitting 25,000 tonnes or more of carbon dioxide (CO_2)in a calendar year.

To ensure complete and efficient reporting of required data for mandatory reporting, ARB staff contracted with an environmental consulting firm to develop a web-based

reporting tool for the required data submittal. The tool, referred to as "The California GHG Reporting Tool," allows the reporting of emissions and other data in a manner that directly addresses the requirements of the Mandatory Reporting regulation. It also enables public access to verified emissions information. Information entered in the tool reflects only that information required by the Mandatory Reporting Regulation.

The tool facilitates complete reporting by ensuring that collected data are consistent with the requirements of the Mandatory Reporting Regulation and provides reporters with automated quality assurance checks on data entered in the tool. All information collected through the tool is housed in a secure, password-protected database. The tool eases the administrative burden on reporters and the State by eliminating the transfer of hard-copy reports. ARB developed a comprehensive user guide and sector-specific reporting guidance documents to assist reporters in using the tool.

DESCRIPTION OF PROPOSED REGULATORY ACTION

AS 32 Cost of Implementation

The proposed regulation imposes fees to fund ARB's actions, as well as other State agencies' actions, associated with carrying out AB 32. The fees are based on a "common carbon cost," which represents the cost of one metric ton of carbon dioxide. ($MTC0_2$) emissions. The proposed regulation specifies that ARB's Executive Officer shall calculate the fees due for each fiscal year, using formulas specified in the regulation, and send the fee determination notice to fee payers no later than 30.days after the end of each calendar year.

The proposed regulation imposes fees on entities in six sectors of the economy: natural gas entities, producers and importers of gasoiine and diesel fuel, refineries, cement manufacturers, retail providers and marketers of imported electricity, and facilities that combust coal.

Natural gas entities include public utility gas corporations, owners and operators of interstate and intrastate natural gas pipelines, and entities that consume natural gas or associated gas produced on-site that are also subject to the Mandatory Reporting Regulation.

The proposed regulation does not apply to any of the following fuels, or to emissions related to the combustion of the following fuels: aviation gasoline, jet fuel, kerosene, liquefied petroleum gas, biodiesel, renewable diesel, residual fuel oil, propane, or any fuel exported for use outside of California.

The proposed regulation also specifies reporting and recordkeeping requirements, and requires fee-paying entities to report this information using ARS's "GHG Reporting TooL" The tool has recently been completed and will be modified to accommodate the reporting requirements of the proposed fee regulation as well as the requirements of the Mandatory Reporting Regulation. .

Proposed Amendment* to *the Mandatory Reporting Regulation

Staff is proposing to amend California Code of Regulations, title 17, section 95104, to require entities subject to the Regulation for the Mandatory Reporting of GHG Emissions to use ARB's "GHG Reporting Tool" to electronically report the required data. The proposed amendment would apply to all entities that are currently required to report GHG emissions pursuant to the Regulation for the Mandatory Reporting of GHG Emissions.

COMPARABLE FEDERAL REGULATIONS

There are no comparable federal regulations that impose fees to implement a GHG emissions reduction law, or that require the use of a reporting tool for sources of GHG emissions.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The ISOR is entitled, "Initial Statement of Reasons (ISOR) for the Proposed AB 32 Cost of Implementation Fee Regulation and Proposed Amendment to the Mandatory Reporting Regulation."

Copies of the ISOR and the full text of the proposed regulatory language may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, California, 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing on June 25, 2009.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons identified below, or may be accessed on ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Mr. Jon Costantino, Manager of the Climate Change Planning Section, at (916) 324-0931, or Ms. Jeannie Blakeslee, Air Pollution Specialist, at (916) 445-8286.

Further, the agency representative and designated back-up contact persons to whom non-substantive inquiries concerning the proposed administrative action may be directed are Ms. Lori Andreoni, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, (916).322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR, and all subsequent regulatory documents, including the FSOR, when completed, are also available on ARB's website for this ru1emaking at http://www.arb.ca.gov/regact/2009/feereg09/feereg09.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

The ARB Executive Officer has determined that, except as discussed below, the proposed regulatory action would not create costs or savings, as defined in Government Code section 11346.5(a)(5) and 11346.5(a)(6), to any State agency or in federal funding to the State, costs or mandate to any local agency or school district, whether or not reimbursable by the State pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary costs or savings to State or local agencies.

The proposed regulation would impose costs on some State and local agencies, but not on school districts. One State agency would be affected: the State Department of Water Resources, which directly imports electricity. However, there would be no net fiscal impact on the Department of Water Resources if it is able to use existing administrative mechanisms to pass the fee costs on to its customers.

The Executive Officer has determined that the proposed regulatory action will create costs and impose a mandate on some local agencies. The local agencies impacted would be those that serve as retail providers and marketers of imported electricity. However, the mandate would apply uniformly to all retail providers and marketers of imported electricity, not just local agencies.

Therefore, the Executive Officer has determined that the proposed regulatory action imposes no costs on local agencies or school districts that are required to be reimbursed by the State pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, and does not impose a mandate on local agencies or school districts that is required to be reimbursed pursuant to section 6 of Article XIII B of the California Constitution.

In addition, there will be indirect costs to State and local agencies and school districts, because the regulation imposes costs on businesses that sell products to State agencies, local agencies, and school districts. ARB estimates that businesses selling gasoline and diesel, natural gas, electricity, and cement will recover their compliance costs by raising their product prices by an average o(less than one tenth of one percent. Staff estimates an increase of approximately $0.0015 per gallon of diesel and gasoline, $0.07 per megawatt-hour of imported electricity from an unspecified source, $0.0007 per therm of natural gas, and $0.10 per ton of cement. ARB does not have data on total State arid local agency purchases of gasoline and diesel, natural gas,

electricity, and cement, so it cannot estimate the total indirect cost to State and local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. ARB has determined that representative private persons would be affected by the cost impacts from the proposed regulatory action. The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuaht to California Code of Regulations, title 1, section 4, that the proposed regulatory action would affect small businesses.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the reporting requirements of the regulation which apply to businesses are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, ARB must determine that no reasonable alternative considered by ARB, or that has otherwise been identified and brought to the attention of ARB, would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may present comments relating to this matter orally or in writing at the meeting, and in writing or bye-mail before the meeting. To be considered by the Board, written comments or submissions not physically submitted at the meeting must be received no later than noon. Pacific Standard Time. June 24. 2009, and addr.essed to the following:

Postal mail: Clerk of the Board
Air Resources Board
1001 I Street, 23rd Floor
Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, e-mail, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engine.

The Board requests, but does not require, that 30copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fUlly consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted to ARB in Health and Safety Code sections 38510,38530,38597,39600,39601, and 41511. This action is proposed to implement, interpret, and make specific Health and Safety Code sections 38501,38505,38510,38530,38597,39300,39600,39601,41511,and 41513.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text, as modified, is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language, as modified, could result from the

proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

J es N. Goldstene
Executive Officer

Date: April 28, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs see our website at www.arb.ca.gov.

State of California
Air Resources Board

STAFF REPORT:
INITIAL STATEMENT OF REASONS FOR RULEMAKING

PROPOSED AB 32 COST OF IMPLEMENTATION FEE REGULATION
AND
PROPOSED AMENDMENT TO THE REGULATION FOR THE MANDATORY REPORTING OF GREENHOUSE GAS EMISSIONS

Date of Release: May 8, 2009
Scheduled for Consideration: June 25, 2009

This Page Intentionally Left Blank .

ACKNOWLEDGMENTS

This report was prepared with the assistance and support from the other divisions and offices of the Air Resources Board. In addition, we would like to acknowledge the assistance and cooperation that we have received from many individuals and organizations.

Authors
Jeannie Blakeslee, lead staff
Bill Blackburn
Mary FaiT
Jennifer Gray
Bill Knox
Bruce Tuter
Ray Olsson
Doug Thompson
Webster Tasat

Contributors:
Pamela Burmich
Larry Hunsaker
Dave Edwards
Candace Vahlsing
Claudia Orlando
Mihoyo Fuji
Steve Brisby

Reviewed by:
Edie Chang
Jon Costantino

This Page Intentionally Left Blank

Proposed AS 32 Cost of Implementation Fee Regulation and Proposed Amendment to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

Initial Statement of Reasons

TABLE OF CONTENTS

Executive Summary

Introduction.
The California Global Warming Solutions Act of 2006, Assembly Bill 32 (Nunez, Chapter 488, Statutes of 2006) requires California to reduce its greenhouse gas emissions to 1990 levels by 2020. On December 11, 2008, the Air Resources Board (ARB) approved a Scoping Plan (Plan), which is California's plan for meeting the greenhouse gas emissions reductions required by AB 32. The administration, implementation and enforcement of the Plan's measures that were designed to achieve the emissions reduction goals will require a stable and continuing source of funding.

AB 32 also authorizes ARB to adopt a schedule of fees to be paid by sources of greenhouse gas emissions to support the costs of carrying out AB 32. The AB 32 Cost of Implementation Fee (the Fee) is included in the Scoping Plan, and is authorized in Health and Safety Code Section (HSC) 38597, which states,

> "The state board may adopt by regulation. after a public workshop, a schedule of fees to be paid by the sources of greenhouse gas emissions regulated pursuant to this division, consistent with Section 57001. The revenues collected pursuant to this section, shall be deposited into the Air Pollution Control Fund and are available upon appropriation. by the Legislature, for purposes of carrying out this division."

Using this section as the basis for its authority, ARB proposes to establish a fee schedule to support implementation of AB 32 by ARB and other state agencies.

This Proposed Regulatory Order combines two regulatory actions: adoption of a Proposed AB 32 Cost of Implementation regulation. and adoption of an amendment to the existing Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (Mandatory Reporting Regulations).

Cost of Implementation Fee
This staff report summarizes the development of the regulation, discusses' the Fee structure and the affected entities arid includes a justification for the proposed Fee regulation. It also describes ARB's approach used to determine the necessary revenue requirements to support State agency implementation of AB 32. It presents staff's proposed approach to balance the goals of applying the fee to greenhouse gas emissions as broadly as possible while minimizing the administrative burden of the regulation.

A design principle for this regulation has been to assess the fee "upstream" whenever possible in order to minimize the number of entities subject to the fee and reduce the complexity and the administrative burden of the regulation. For the purposes of this regulation, "upstream" is the point in California's economy where fuel delivery or production is intended for eventual delivery to consumers. This leads

to subsequent combustion or use and results in greenhouse gas emissions. When it is not feasible to assess fees "upstream", fees are assessed on entities that consume or produce fuels in California.

Staff designed this proposed Fee to cover greenhouse gas emissions as broadly as possible to spread the cost burden over the majority of emission sources. This fee would cover three different groups of emissions sources that together comprise approximately 85 percent of California's total greenhouse gas emissions. First, it will be assessed on fossil fuels that are combusted in California, including fuels used for transportation, and electricity generation, by industry, and in residences and commercial buildings. Second, it will cover the major sources of industrial process greenhouse gas emissions. Finally, in a manner consistent with AB 32 emissions accounting provisions, the Fee will cover imported electricity, based on the fuels used for its generation.

The revenues from the assessed fees would be used to pay the ongoing AB 32 program costs incurred by ARB and other state agencies, beginning in the 2009-2010 fiscal year, currently estimated at approximately $36.2 million per year. During the first four years, the revenues would also be used to repay loans included in the adopted State Budget. These loans were used to pay a significant portion of the AB 32 implementation costs of ARB and the California Environmental Protection Agency (Cal/EPA) for the 2007/2008 and 2008/2009 fiscal years. This staff report also includes a discussion of ongoing revenue requirements for ARB, Cal/EPA and other state agency AB 32 implementation activities in Appendix C.

It is important to note that California's AB 32 program is still under development. As the program continues to mature, staff intends to periodically re-evaluate the sources covered by this fee to determine whether the additional sources of greenhouse gas emissions should also be included in the Fee regulation. Staff will also continue to evaluate how the state's AB 32 program can best be funded. For example, if a cap-and-trade program were adopted that generated revenue and covered a sufficiently broad range of the state's greenhouse gas emissions, it would be appropriate to evaluate funding the State's implementation of AB 32 from that revenue instead of this fee.

Mandatory Greenhouse Gas Emissions Reporting

On December 6, 2007, ARB adopted the Mandatory Reporting Regulation as required by AB 32. The regulation requires major sources of greenhouse emissions, such as operators of power plants, cogeneration facilities, cement plants, refineries, hydrogen plants, retail providers and marketers of electricity, and general stationary combustion facilities emitting 25,000 metric tons of carbon dioxide in a calendar year to report those emissions to the State of California annually beginning in 2009. To facilitate reporting, ARB contracted for the development of the California Greenhouse Gas Reporting Tool (Reporting Tool) that was completed in spring of 2009. Technical assistance and guidance is available on ARB's internet website.

The use of the Reporting Tool has been voluntary. The proposed amendment to the regulation would make use of the Reporting Tool mandatory.

Economic Impacts Associated with the Proposed Regulatory Order

In developing the Fee regulation, ARB evaluated the potential economic impacts on representative private persons or businesses and consumers. ARB staff believes that if such a pass through occurs, the cost impacts from the proposed regulatory action would result in average product price increases of less than one-tenth of one percent. ARB has determined that representative private persons would be affected by the cost impacts from the proposed regulatory action at an estimated cumulative cost of $ 4.00 per household per year when the marginally increased utility and fuel costs are passed through to the consumer.

I. Introduction **and Background**

This report presents ARB staff's proposed Cost of Implementation Fee (Fee) Regulation pursuant to the California Global Warming Solutions Act of 2006, Assembly Bill 32 (Nunez, Chapter488, Statutes of 2006). The broad scope of AB 32 requires an extensive effort to reduce the state's greenhouse gas emissions, and provides ARB with the authority to adopt a fee to be paid by sources of greenhouse gas emissions to coverthe costs of carrying out AB 32.

On December 11, 2008, ARB approved a Scoping Plan[1] that provides a blueprint for California to meet the greenhouse gas emissions reductions required by AB 32. The Scoping Plan indicates that administration, implementation and enforcement of the emissions reduction measures will require a stable and continuing source of funding. The Fee is authorized in Health and Safety Code Section (HSC) 38597, which states,

> liThe state board may adopt by regulation, after a public workshop, a schedule of fees to be paid by the sources of greenhouse gas emissions regulated pursuant tothis division, consistent with Section 57001. The revenues collected pursuant to this section, shall be deposited into the Air Pollution Control Fund and are.available upon appropriation, by the Legislature, for purposes of carrying out this division."

Using this section as the basis for its authority, ARB proposes to establish a fee schedule to support implementation of AB 32 by ARB and other state agencies. Funds collected would be deposited in the Air Pollution Control Fund and would be available upon appropriation by the Legislature.

Because greenhouse gas emissions and their subsequent impacts on global warming affect all Californians, staff has developed the Fee so that state government costs to implement the AB 32 program are streamlined and these costs are equitably distributed among a broad range of greenhouse gas sources. This approach will also minimize the burden the Fee may place on individual entities or sectors of the economy. This proposed regulation was developed through an extensive public process involving a broad range of stakeholders.

Staff expects the regulation to take effect before January 1, 2010. Entities will report to ARB the quantity of fuels and emissions subject to the Fee by January 2, 2010 for calendar year 2008 using ARB's Reporting Tool. ARB is also proposing to amend the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (Mandatory Reporting Regulation) to require use of the reporting tool for data submittal. Beginning in January 2010, ARB will determine the fee amounts for each entity based on the reported quantities of fuel or emissions, using the fee calculation methodology described in this staff report and the proposed regulation. ARB would

1 California Air Resources Board, Climate Change Scoping Plan: A Framework for Change, released October, 2008

notify the fee paying entities by February 1, 2010. The fee paying entities would be required to submit payment within 60 days after receipt of the notification.

This fee is intended to cover two areas of costs for implementing AS 32:

- Staff related expenditures for the start-up and ongoing implementation of the AS 32 program that have been approved through budget change proposals (SCPs) after AS 32 was signed into law (September 2006).

- Other post AS 32 SCPs approved costs directly related to the administration of AS 32 programs to reduce greenhouse gas emissions, such as contracts, administrative overhead, and research directly related to the implementation of the AS 32 program.

II. Description of Proposed Regulation

The proposed regulation assesses fees on sources of greenhouse gas emissions from the most widely used fossil fuels, including gasoline, diesel, coal, refinery gases and natural gas. The Fee would also be assessed on non-combustion greenhouse gas process emissions from refineries and cement manufacturers. Finally, the Fee would be imposed on the greenhouse gas emissions associated with the generation of imported electricity. Together, emissions from fuel combustion, refining and manufacturing process emissions, and imported electricity account for over 85 percent of California's greenhouse gas emissions.

ARB is also proposing to amend the Mandatory Reporting Regulation by requiring the use of the Reporting Tool. The Mandatory Reporting Regulation was approved by ARB in December, 2007.

A. Fee .Regulation Development

ARB staffengaged in an extensive outreach process during development of the proposed regulation. In accordance with HSC section 38561, ARB staff consulted with other state agencies that have jurisdiction over sources of greenhouse gas emissions. ARB consulted with the Public Utilities Commission, the State Energy Resources Conservation and Development Commission, and other departments and agencies. Staff held public workshops on January 27, 2009, February 25, 2009, and April 20, 2009 to obtain stakeholder input, and provided concept papers and draft regulations for stakeholder comment. Staff met with stakeholders from each sector covered by the proposed regulation on numerous occasions and considered comments received during this process.

In addition, ARB is proposing to amend the Mandatory Reporting Regulations to require the use of the reporting tool to report data.

B. Approach to Regulation

Generally, the proposed Fee regulation pursues an "upstream" approach. The regulated entity would be assessed a fee for the greenhouse gas emissions from fuel an entity introduces into commerce in California, or the direct greenhouse gas emissions as a result of an industrial process. The upstream approach minimizes the administrative burdens associated with the regulation since it decreases the number of entities that must pay fees, and simplifies the reporting needed to determine the fees.

ARB staff reviewed each category of sources of greenhouse gas emissions and evaluated whether or not it was technically and economically feasible to include them under the proposed regulation. Sources that are not included in the proposed regulation could potentially be included in the future.

One major goal of the proposed regulation is to equitably impose fees on the widest possible spectrum of greenhouse gas sources in an administratively feasible manner. This cannot be done unless some type of administrative mechanism is used to impose a fee on upstream entities, which can then pass on the cost of the fee by increasing the cost of the fuel supplied to downstream entities. An importanf question was just how far upstream to impose such a fee. ARB has chosen an approach that reaches as far upstream as possible. This approach both minimizes the number of individual entities that must be billed and helps ensure that almost all of the greenhouse gas emissions resulting from the consumption of gasoline, diesel, and natural gas in California are subject to the Fee. There are other possible collection points for fees. The various fee collection options, and ARB's reasons for rejecting them, are discussed in the "Alternatives" section of this Initial Statement of Reasons.

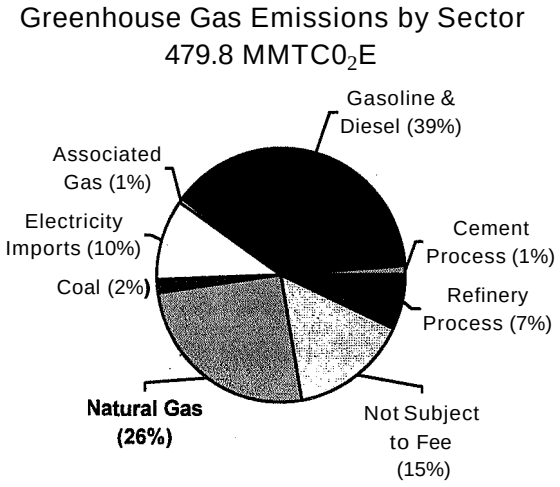
C. Emission Sources Subject to the Proposed Fee

The 2006 Greenhouse Gas Emission Inventory estimates total greenhouse gas emissions in California at 479.8 million metric tons (MMT) of C02E. Figure 1 below illustrates the sources of greenhouse gas emissions in California and their respective proportions of emissions. Most greenhouse gas emissions in California result from the combustion of gasoline and diesel (39 percent) and natural gas (26 percent). These emissions are associated with fuel use activities ranging from transportation, manufacturing and refining processes to electricity generation to heating buildings. Two percent of the in-state emissions are from combustion of coal. Thus, 67 percent of the state's total-greenhouse gas emissions are from the four major fuels that are subject to the proposed regulation. Approximately 10 percent of the state's total emissions are associated with imported electricity, which ARB proposes to include in this regulation, and is discussed in the next section of this ISOR. Cement and refinery processes account for more than eight percent of greenhouse gas emissions in California, but 95 percent of the state's industrial greenhouse gas process emissions. [2]

At this time, ARB proposes not to assess fees on the remaining 15 percent of greenhouse gas emissions in the emissions inventory in the Fee regulation. These emissions include emissions from high global warming portential gases (which are anticipated to be covered by a separate fee currently under development), some agricultural sources (such dairy methane), emissions from the forest sector, select fuels which are used in small quantities such as aviation gas, jet fuel, kerosene, biodiesel, and fuels exported out of state.

[2] ARB Greenhouse Gas Inventory Database

Figure 1. TOTAL STATEWIDE GREENHOUSE GAS EMISSIONS BY SECTOR



Source: 2006 Greenhouse Gas Inventory

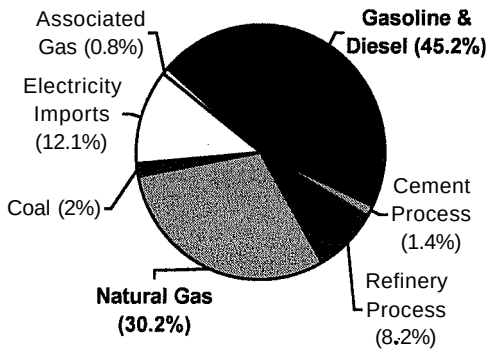
The proposed Fee would apply to six sectors of sources that account for approximately 85 percent of California's total greenhouse gas emissions, or 412 MMTC0$_2$[3].

Figure 2 below illustrates the sectors covered under the Fee regulation and their respective proportions of emissions compared to each sector to which a fee will be applied. The majority of greenhouse gas emissions under the Fee regulation are from the combustion of gasoline and diesel (45 percent) and natural gas (31 percent, including associated gas). Approximately 12 percent ofthe emissions covered under the Fee are associated with imported electricity. Emissions from coal combusted in the state account for approximately two percent of the emissions covered under the fee. Finally, industr1al process emissions due to processes other than combustion of natural gas or coal at refineries and cement manufacturers account for approximately eight percent and 1.5 percent, respectively, of emissions covered under the Fee regulation.

[3]The proposed Fee regulation focuses on CO_2 instead on $C0_2E$.

Figure 2. GREENHOUSE GAS EMISSIONS COVERED BY FEE

Greenhouse Gas Emissions by Sector
412 MMTC0_2



Source: 2006 Greenhouse Gas Inventory

A discussion of how the proposed Fee would be assessed for each emission category follows[4]:

Combustion of Natural Gas

Combustion of natural gas accounts for approximately 26 percent of the overall greenhouse gas emissions in California, and 30 percent of the emissions covered in the Fee regulation. Affected entities in the natural gas sector subject to this regulation include the following:

- Public utility gas corporations that deliver natural gas to end users;
- Interstate and intrastate pipelines delivering natural gas directly to end users;
- Natural gas producers consuming gas produced onsite, and are subject to ARB Mandatory Reporting Regulation; and
- Producers of "associated gas" that consume associated gas produced onsite and are subject to ARB's mandatory reporting regulations.

Although natural gas is widely consumed in the California economy, supply is physically constrained by pipelines, making identifying upstream operators relatively straightforward. This is why the fee is applied at the pipeline for all natural gas consumers on that pipeline.

[4]The proposed points of regulation for this Fee and the assumptions and methods used in calCUlating the fee for fuels, process emissions and imported electricity, would be applicable only to this regulation and are not intended establish a precedent for how sources of emissions would be treated under any future regulation, including a cap and trade regulation.

ARB's research indicates that approximately 80 percent of the natural gas used in the State is eventually transmitted over public utility gas corporation pipelines owned by Pacific Gas and Electric, Southern California (SoCal) Gas, and San Diego Gas and Electric. A portion of the natural gas transmitted by these public utility corporations "in their pipelines is not owned by the utilities, but is simply transmitted for a fee to end users. Since a transmission fee is applied by those entities, the companies transmitting natural gas, the utilities, would be the most appropr.iate upstream source to which the Fee should be attached. Public utility gas corporations would annually report the therms of natural gas delivered to end users in California via their pipelines.

About 10 percent of the natural gas used in the state is purchased directly from interstate pipelines, never touching the in-state public utility corporation pipelines. There are eight interstate pipelines that deliver natural gas into the state, and distribute natural gas directly to end users. The interstate pipeline owners or operators would annually report the therms of natural gas as measured at the meter directly delivered to end users in California.

The final 10 percent of the natural gas produced and consumed in California is never transported via public utility corporation pipelines or interstate pipelines. Two distinct processes need to be addressed to incorporate this remaining natural gas: direct deliveries from intrastate pipelines and natural gas and associated gas produced and used at the production site.

Direct Delivery:

- A small number of large customers receive natural gas directly from intrastate companies that include Pacific Gas and Electric, SoCal Gas, and San Diego Gas and Electric. Gas transported directly to end users over intrastate pipelines would be subject to the Fee. The pipeline operator is the most appropriate upstream source to which to apply the Fee. Owners or operators of intrastate pipelines that deliver natural gas directly to end users would annually report the therms delivered at the end users' meter, similar to the public utility gas corporations.

  Producers consuming a portion of the natural gas they produce directly onsite would also be subject to the Fee. ARB's research indicates that fewer than 20 facilities emit the majority of the CO_2 emissions in this category and that these facilities are already subject to ARB's Mandatory Reporting Regulation. These sources would report the therms of natural gas produced and subsequently consumed on-site.

Associated Gas:

Finally, a by-product of the oil production process is associated gas, which consists mostly of natural gas. This by-product is used for some combustion equipment. Oil production facilities that use associated gas produced on-site and that are subject to the Mandatory Reporting

Regulation would be subject to the Fee. Unlike other entities that would be charged a fee per therm of natural gas reported, the Fee for associated gas would be based on the reported greenhouse gas emissions resulting from consumption of associated gas and would be assessed on oil production facilities.

Producers and Importers of Gasoline and Diesel Fuels

Emissions from combustion of gasoline and diesel fuel accounts for 39 percent of the state's total greenhouse gas emissions. These emissions occur when on-road vehicles (passenger cars, light duty trucks, heavy-duty vehicles, and motorcycles), off-road vehicles (bulldozers, lawn mowers, marine craft) and other sources combust gasoline and diesel fuel.

Staff is proposing to apply the fee to producers and importers of:

- California gasoline;
- California Reformulated Gasoline Blendstock (CARBOB), which is blended with an oxygenate to create California gasoline; and
- California diesel. .

California has 21 refineries located in the San Francisco Bay area, the Los Angeles area, and the Bakersfield area. California used about 4 billion gallons of diesel and 15.7 billion gallons of gasoline in 2007.[5]

Producers and importers of gasoline and diesel would report the quantity of fuels supplied for use in the State. To ensure that ARB only compares quantities of finished gasoline, ARB will adjust for the total quantity of finished fuel made from CARBOB. The reported quantity of CARBOB would be multiplied by a factor that adjusts for the gallons of final product (gasoline). For example, one gallon of CARBOB formulated for blending with five percent ethanol would be adjusted as follows:

1.0* (CARBOB) + «O.05/(1.0-0.05))*(ethanol) = approximately 1.0526 gallons finished gasoline, with the Fee assessed on the gallons of finished California gasoline.

Under the proposed regulation, the fee would apply to the intrinsic greenhouse gas emissions from ethanol that is blended with CARBOB to produce gasoline. As ARB implements the recently approved Low Carbon Fuel Standard to reduce the carbon content of transportation fuel, ARB will revisit how the emissions from transportation fuels are calculated.

5 Air Resources Board, 2006 Greenhouse Gas Emissions Inventory

Industrial Emissions from Refineries and Cement Manufacturers

Emissions from these sources account for over eight percent of California's greenhouse gas emissions - over seven percent from the refinery process, and approximately 1.5 percent from the cement manufacturing process.

Refineries:
The Fee on emissions associated with the refinery processes would be determined in two parts: first, the emissions from the combustion of products of the refinery process other than gasoline and diesel (petroleum coke, catalyst coke and refinery gas), and second, the direct emissions from the refinery process itself.

Emissions from combustion of petroleum coke, catalyst coke and refinery gas produced by each.refinery would be reported to ARB consistent with information reported to the California Energy Commission under the Petroleum Industry Information Reporting Act (PIlRA). PIiRA requires that refineries report data on the production of these products, as well as the amount exported out of the state. Since the Fee will not be applied to emissions from the combustion of these' products outside of California, each refinery will report the individual quantities of catalyst coke, petroleum coke, and refinery gas produced annually, less the quantities exported out of the state.

The Fee would be applied to the refinery responsible for the creation of the refining process by-product, which is the furthest upstream point in this process. Staff expects that the Fee would be passed through if the by-product is sold and ultimately combusted by another party. Additionally, emissions from the consumption of feedstock other than natural gas used in the steam methane reforming process (hydrogen production), as reported under ARB's Mandatory Reporting Regulation, would be subject to this fee. Any use of natural gas is accounted for in the natural gas sector as described above.

Cement Manufacturing:
Emissions from the cement manufacturing process originate from two sources: fuel combustion and by-products from the clinker production process.

Approximately half of the emissions come from fuel combustion, and the Fee would be applied to the applicable fuel (e.g. coal, natural gas) combusted. The remaining half of the emissions are a by-product of the clinker production process. Limestone ($CaC0_{3)}$ and other chemicals are heated and undergo a chemical reaction that directly emits CO_2. Cement manufacturers are subject to mandatory reporting, with emissions from the clinker production process reported as a separate line item. Staff proposes to assess a fee to the manufacturer based on the emissions of CO_2 from this process.

Imported Electricity

To provide context for the discussion of the application of the Fee to imported electricity, this section begins with a brief, general discussion of California electricity.

The electricity generation sector, including both in-state generation and electricity imported into the State, accounts for 23 percent of California's total greenhouse gas emissions. Sources of California's electricity include non-emitting generation such as hydropower, nuclear, and renewable energy (including solar, wind, geothermal, small hydropower, and biomass) as well as fossil fuel generation (primarily natural gas and coal). Non-emitting sources typically supply about 40 percent of California's electricity annually.

Natural gas supplies over 40 percent of total electricity consumed in California, and comprises the majority of in-state fossil fuel generation[6]. In-state generation from fossil fuels includes both power plants that deliver electricity to the grid, and cogeneration facilities that may use power onsite and/or sell power to the grid. Hydropower, nuclear power and renewables are also important in-state electricity sources. Very little of the electricity generated in-state is from coal.

AB 32 includes in its definition of "statewide greenhouse gas emissions" all emissions of greenhouse gases from the generation of electricity "delivered to and consumed in California, accounting for transmission and distribution losses, whether the electricity is generated in the state or imported" (HSC section 39505). Thus, AB 32 specifically requires ARB to consider imported electricity in the implementation of the statute.

California imports electricity from other western states, British Columbia and Northern Mexico. Most imported electricity is generated at facilities that burn coal or natural gas or at hydroelectric or nuclear facilities. The amount of electricity consumed, as well as the amount available from each source type, varies year to year, depending on the amount of water available and on variation in weather conditions.

Imported electricity typically supplies between 20 and 30 percent of the electricity consumed in California. However, because it includes a sizable percentage of high emission coal generation, it is responsible for about 50 percent of the greenhouse gas emissions associated with electricity generation, or 10 to 13 percent of total California greenhouse gas emissions. This proposed Fee. would be imposed on imported electricity in order to reflect this significant source of California's greenhouse gas emissions.

To assess the Fee in an equivalent manner on both imported electricity and electricity generated in California, staff propose to apply, in both cases, the same

6 Source: CEC, 2007 Net System Power Report. See also System Power tables for 2002-2007 available at: http://energyalmanac.ca.gov/electricitv/totalsystempower.html

cost per metric ton of CO_2 emitted due to electricity generation. However, because California cannot apply the Fee to upstream suppliers of fuel to out of state generation facilities (as ARB proposes to do with in-state facilities), two different, but equivalent approaches are needed.

The discussion of Fee calculations below shows how the fee is applied to fuels used to generate electricity in-state, and to imported electricity. Although the units (therms of natural gas, short tons of coal, MWh of electricity) to which the Fee is applied may vary, the impact of the fee is equivalent for electricity generated in-state or out-of-state, because it is based on CO_2 emitted in the generation of ele"ctricity.

For electricity generated in-state, fees would be paid by entities that deliver natural gas for electricity generation, and facilities that consume coal for electricity generation. For imported electricity, it is not feasible for fees to be applied to suppliers of fuels, or to use the generation facility located out of state as the point of regulation, because California does not have jurisdiction over these entities. Instead, the fee would be applied to imported electricity when it is first delivered into California. The basis for calculating the Fee, the CO_2 emissions, is the same. However, the mechanism for collection and the entities subject to the Fe would be distinct.

Fees would be paid by entities that import electricity into California. These are retail providers of electricity and marketers, as defined in the regulation. There are approximately 70 retail providers and 60 marketers that could be subject to this regulation.

Electricity imported into California falls into two classes: electricity generated from specified sources (either a generation facility or an asset-owning or asset-controlling supplier for which emissions and electrical generation can be tracked), and electricity from unspecified sources (the facility where the electricity is generated is unknown). Quantities of imported electricity of both types are required to be reported under ARB's Mandatory Reporting Regulation.

The fee rate per MWh of electricity imported from specified sources would be calculated as the source's emission factor multiplied by the cost per $MTC0_2$ emitted (defined below as the Common Carbon Cost.) The next section on calculation methodologies shows, in detail, how emission factors are calculated for various kinds of specified sources. The ca"lculations would use data that has been reported by the source either to ARB under the Mandatory Reporting Regulation, or to Federal agencies.?

7 Data reported to Federal agencies includes that reported to the U.S. Environmental Protection Agency pursuant to 40 CFR Part 75, downloadable at: http://frwebgate3.access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=56534622613+1 +2+0&WAISaction=retdeve: and monthly and annual data on generation and fuel consumption at power plant and prime mover level reported to

For imported electricity from unspecified sources, staff would use a default emission factor of 0.499 MTC02 (1,100 pounds) per MWh of C02 per MWh. This default value was recommended by the CPUC and the CEC in CPUC Decision 07-09-017 as an interim regional default emission factor for electricity imported from unspecified sources for use in tracking and verification of greenhouse gas emissions[8]. As discussed in the decision, this value is close to the regional average for the western. states, and also approximates an emission factor for marginal electricity generation available in the market (generated at a natural gas' facility). Appendix D provides further detail on the default emissions factor for unspecified imports.

Coal

Coal combustion is responsible for approximately two percent of California's total greenhouse gas inventory. Owners and.operators of power plants, cogeneration facilities and other facilities that use coal as a fuel and that are subject to ARB Mandatory Reporting Regulation are subject to the fee. The affected entities would report tons of coal and the associated grade of coal combusted.

D. Fee Calculation Methodology

ARB will annually calculate a cost per unit CO_2 under this regulation, based on the Total Revenue Requirement, the quantities of reported fuels, imported electricity, and process emissions and the fuel and imported electricity emissions factors.

Each year ARB would determine the annual revenue requirement. The Total Revenue Required would be the sum of legislatively approved AB 32 program expenditures and, in the first four years, an additional amount needed to repay the start up loans for ARB and Cal/EPA. The Total Required Revenue will also be adjusted for any excess or shortfall in collections from the previous year. The intended use of the Fee is to fund the administrative costs of activities to carry out AB 32, and not those related to adaptation or other climate activities. Additional detail is included in Appendix C.

the Energy Information Administration, and available online at:
http://www.eia.doe.gov/cneaf/electricity/page/eia906920.html

8 CPUC (California Public Utilities Commission), 2007. Decision 07-09-017: Interim Opinion on Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector. http://docs.cpuc.ca.gov/word pdf/FINAL DECISION/72513.pdf

Assigning a common cost to the emissions of greenhouse gases is a critical component to this regulation. This is known in the regulation as the Common Carbon Cost, or eec and is defined as follows:

$$CCC = \frac{TRR}{(Q_c \times EF_{c)} + (Q_{ng} \times EF_{ng)} + (Q_g \times EF_{g)} + (Qd \times EFd) + (Qie \times EF_{ie}) + TEl}$$

Where

TRR= Total Required Revenues in accordance with proposed section 95203(a)

$(Q_C \times EF_C)$ = Statewide total quantity of emissions from coal calculated as the sum of:

(Qb x EFb) = Quantity of bituminous coal x emission factor for bituminous coal;

(Ql x EF,) = Quantity of lignite coal x the emission factor for lignite coal;

$(Q_a \times EF_{a)}$ = Quantity of anthracite coal x the emission factor for anthracite coal;

$(Q_{Sb} \times EF_{Sb})$ = Quantity of subituminous coal x the emission factor for subituminous coal;

Q_{ng} = Statewide quantity in therms of natural gas supplied during the reporting period

EF_{ng} = Emission Factor of MTC02 for each supplied therm of natural gas

Statewide quantity of California gasoline supplied during the reporting period. This is the volumetric sum of California gasoline produced or imported into California and the amount of finished CARBOB product produced or imported into California. The finished gasoline product is calculated as the volume of CARBOB multiplied by one plus the maximum amount of oxygenate designated for each volume of CARBOB.

Emission Factor of $MTC0_2$ for each supplied gallon of California gasoline

Q_d = Quantity of California diesel fuel supplied during the reporting period

EF_d = Emission Factor of $MTCO_2$ for each supplied gallon of diesel fuel

$(Q_{ie} \times EF_{ie})$ = Total C02 emissions from total imported electricity as the sum of:

$(Q_{sp} \times EF_{sp})$ = Quantity of MWh of electricity imported from each specified source "sp" x emission factor for that specified source

$(Q_{usp} \times EF_{usp})$ = Statewide quantity of MWh of electricity imported from unspecified sources x emission factor for unspecified source.

TEl = Total state process emissions for cement manufacturers and refineries, and emissions from the combustion of associated gas.

Once ARB calculates the CCC, the basic calculation methodology for the Fee applied to each sector is similar. Generally, the Fee is determined by multiplying the CCC by the total emissions for each entity. For-entities reporting quantities of fuels or imported electricity, an intermediate step is necessary to calculate fee rates based on emissions per unit of fuel or electricity. For each fuel, Fuel Fee Rates are calculated based on the emissions associated with fuel combustion. Electricity fee rates are calculated for imported electricity based on the emissions from the generation of the electricity.

Calculation of Fuel Fee Rates for entities reporting quantity of fuel: For natural gas (not including associated gas), gasoline and diesel, and coal, the Fuel Fee Rate for each unit of fuel reported is the product of the CCC multiplied by the appropriate emission factor, as follows:

$FR_i = CCC \times EF_i$

Where:

FR_i = The Fuel Fee Rate for the fuel
CCC = Common Carbon Cost
EF_i = Emission Factor of $MTCO_2$ for each unit of fuel supplied or consumed.

Fuel units are therms, gallons and short tons for natural gas, gasoline and diesel, and coal, respectively. Emissions factors for each fuel are shown in Table 1 below.

Table 1: Emission Factors by Fuel Type

Fuel Type	CO_2 Emission Factor	Emission Factor Units
Coal		
Anthracite	2,597.94	kg CO_2 / short ton
Bituminous	2,328.35	kg CO_2 / short ton
Sub-bituminous	1,673.64	kg CO_2 / short ton
Lignite	1,369.32	kg CO_2 / short ton
Natural Gas	5.302	kg CO_2 / therm
Diesel	9.96	kg CO_2 / gallon
Gasoline	8.55	kg CO_2 / gallon

The fuel emission factors are those specified in Appendix A of the "Regulation for the Mandatory Reporting of Greenhouse Gas Emissions", *ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions.*

Fee *for entities reporting quantities of fuel:* For California diesel, California gasoline and the adjusted quantity of CARBOB, each gallon reported would be multiplied by the Fuel Fee Rate for each fuel to determine the annual fee. The Fee for each entity reporting fuel delivery or use is calculated as follows:

$$Fee = FR_j \times QF_j$$

Where:

QF_j = Quantity of fuel
FR_j = The Fuel Fee Rate for the fuel

Calculation of Imported Electricity Fee Rates: An Imported Electricity Fee Rate (EFR) will be calculated for each specified source, including asset-owning and asset-controlling suppliers, and the default emission factor previously discussed will be used to calculate an Imported Electricity Fee Rate for imported electricity from unspecified sources. Greenhouse gas emissions from the facilities that generate electricity depend on the quantities and types of fuels used, facility emissions, and on the efficiency with which the facility converts the energy in fuels to electrical energy. For any generating source or group of sources, a CO_2 emissions factor (MTC02 per MWh) can be calculated by dividing the total facility emissions by the total electricity output of the facility or group of facilities. Imported Electric Fee Rates will be calculated as follows:

$EFR_{sp} = CCC \times EF_{sp}$
$EFR_{asp} = CCC \times EF_{asp}$
$EFR_{usp} = CCC \times EF_{usp}$

Where:

"sp" denotes a specified source that is a generating facility or unit

"asp" denotes an asset-owning or asset-controlling supplier

"usp" denotes an unspecified source

CCC = Common Carbon Cost

EFR_{sp} =The Imported Electricity Fee Rate for the specified source

EFR_{asp} = The Imported Electricity Fee Rate for the asset-owning and asset-controlling suppliers

EF_{sp} = Emission Factor for specified source in $MTCO_2$ per MWh

EF_{asp} = Emission Factor for asset-owning and asset-controlling suppliers in MTC02 per MWh

EFR_{usp} = The Imported Electricity Fee Rate for unspecified sources

EF_{usp} = 0.499 $MTCO_2$ per MWh, the default Emission Factor for unspecified sources

Emission Factors for Imported Electricity

ARB will calculate emission factors for imported electricity from specified sources (including generation facilities, asset-owning and asset-controlling suppliers) by dividing the source's C02 emissions by electric generation output as detailed in the equations below. The resulting emission factor for each specified source, in $MTCO_2$ per MWh, is applicable to any quantity of electricity imported from the source. Calculations are as follows:

For specified sources that are generating units or facilities:

$$EF_{sp} = \frac{E_{sp}}{EG}$$

Where:

EF_{sp} = Emission Factor for specified source in $MTCO_2$ per MWh

E_{sp} = CO_2 emissions from electricity generation for a specified electric generating facility/unit for the report year ($MTCO_2$)

EG = Net generation from a specified electric generating facility/unit for the report year (MWh)

(1) For specified electric generating facilities/units whose operators are subject to reporting or who voluntarily report under the Mandatory Reporting Regulation, E_{sp} shall be equal to the sum of C02 emissions directly associated with electricity generation as reported to ARB. Similarly, EG shall be the net generation reported to ARB.

(2) For specified electric generating facilities/units whose operators are not subject to Mandatory Reporting Regulation but who are subject to the Acid Rain Program (40 CFR Part 75), E_{sp} shall be equal to the amount of CO_2 emissions reported to U.S. EPA pursuant to 40 CFR Part 75 for the facility in metric tons for the report year. EG shall be data reported to EIA and published in the EIA 923 Excel file for the reporting year available at http://www.eia.doe.gov/cneaf/electricity/page/eia906 920.html (the EIA data).

(3) For specified electric generating facilities/units whose operators do not report to ARB under the Mandatory Reporting Regulation and do not report to U.S. EPA under the Acid Rain Program, EG shall be taken from the EIA data for the reporting year. E_{sp} shall be calculated using EIA data as shown below.

$$E_{sp} = 1000 \times \sum(Q_{fuel} \times EF_{fuel})$$

Where:

Q_{fuel} = Heat of combustion for each specified fuel type from the specified electric generating facility for the report year (MMBtu)

EF_{fuel} = CO_2 emission factor for the specified fuel type as described in the Mandatory Reporting Regulation, Appendix A ($kgC0_2$/MMBtu).

For asset·owning. and asset·controlling suppliers:

$$EF_{asp} = \frac{\sum E_{asp} + \sum(PE_{sp} * EF_{sp}) + (PE_{usp} * EF_{usp}) - \sum(SE_{sp} * EF_{sp})}{\sum EG_{asp} + \sum PE_{sp} + PE_{usp} - \sum SE_{sp}}$$

EF_{asp} = Emission Factor for asset·owning and asset·controlling suppliers "asp," in $MTCO_2$ per MWh

$\sum E_{asp}$ = the sum of CO_2 emissions from electricity generation for each specified electric generating facility/unit in the asset owning/controlling supplier's fleet, as reported to ARB under the Mandatory Reporting Regulation (MTC02)

$\sum EG_{asp}$ = the sum of net generation for each specified electric generating facility in the asset owning/controlling supplier's fleet for the report year as reported to ARB under the Mandatory Reporting Regulation (MWh)

$\sum PE_{sp}$ = Sum of electricity purchased from specified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

PE_{usp} = Amount of electricity purchased from unspecified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

$\sum SE_{sp}$ = Amount of wholesale electricity sold from a specified source by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

EF_{sp} = CO_2 emission factor as defined for generating units and facilities.

EF_{usp} = C02 default emission factor for unspecified sources (0.499 $MTC0_2$ per MWh).

For unspecified sources:

The default emission factor.for unspecified sources shall be the default emission factor of 0.499 $MTC0_2$ per MWh.

ARB will use the default emissions factor of 0.499 $MTC0_2$ per MWh to calculate emissions for electricity imported from all unspecified sources. Further detail on ARB's choice of this default emissions factor is provided in Appendix D. Sources of data used for calculating emissions from imported electricity include:

- data provided by marketers and retail providers (including asset owning and asset controlling suppliers) under ARB's mandatory reporting regulation
- data reported to the U.S. Environmental Protection Agency pursuant to 40 CFR Part 75
- data on generation facilities reported to the Energy Information Administration, including fuel use, fuel heat content, and net electricity generation

Fee for Entities Reporting Imported Electricity

For each retail provider or marketer the Fee is based on the quantity of electricity imported from each specified source and from unspecified sources as reported:

Fee = EFR_j x QM_{ei}

Where:

EFR_j = The Electricity Fee Rate for the specified source or unspecified source.
QM_{ei} = Quantity of electricity imported

E. Administration and Enforcement

The first year of implementation differs with respect to the submittal of reports to ARB. All affected entities would be required to report their 2008 emissions, or quantities of therms or fuels by January 2010 utilizing the Mandatory Greenhouse Gas Emissions Reporting Tool (Tool), in accordance with section 95104(e) of the Mandatory Reporting of Greenhouse Gas Emissions Regulation. ARB would send out Fee Notices to the affected entities by February 1, 2010, and payment would be due in April, 2010.

In subsequent years, affected entities would report their prior calendar year's emissions in June using the Tool. For those entities subject to ARB's Mandatory Reporting Regulation, changes'made to the reported data as a result ofthe verification process must be concluded by December 1 of each year. Fee Notices would be sent out in January, the following year, and Fee payment would be in March, the same year the Fee Notice is sent.

ARB will modify the Reporting Tool so the affected entities not sUbjectto the Mandatory Reporting Regulation can also report their information using the Tool.

The proposed Fee regulation includes enforcement provisions. Any violation of the proposed'regulation is subject to the penalty provisions set forth in Health and Safety Code section 38580. Failure to submit any required report, submittal of incorrect statements, or to pay the Fee would constitute a violation.'The proposed regulation also includes audit provisions, whereby ARB may contract with outside entities to obtain data or services needed to audit the returns provided by Fee payers. ARB may use Fee revenues collected to fund auditing and collection procedures.

F. Expenditures to be Supported by AS 32 Cost of Implementation Fee

The purpose of this proposed regulation is to repay loans that were used to fund ARB and the California Environmental Protection Agency's (Cal/EPA) implementation of AB 32 in fiscal years *2007/2008* and *2008/2009* and to create

a stable and steady funding source for state agencies to carry out AB 32 in future years. This section describes the loans, as well as how ARB proposes to determine the Required Revenue to carry out AB 32 in fiscal year 2009/2010 and future budget years.

This fee would cover expenditures for implementing AB 32, including:

1. 2007/2008 fiscal year loan repayment for ARB and Cal/EPA
2. 2008/2009 fiscal year loan repayment for ARB and Cal/EPA
3. 2009/2010 fiscal year and future year costs for ARB, Cal/EPA and other California state agencies.

The amount of revenue collected through the fees is the Required Revenue, which is the total amount of funds necessary to recover the costs of implementing the AB 32 program, plus loan repayment. The Required Revenue is based on the number of personnel positions, including salaries and benefits, and other expenses (contracts, equipment, etc.), approved in the California Budget Act for that fiscal year. The Total Required Revenue is the Required Revenue adjusted for excess or under collection from the previous fiscal year.

Repayment of Loans

For the 2007/2008 fiscal year, a portion of the expenditures by ARB and Cal/EPA to implement AB 32 were supported by loans. ARB is proposing that only loan-related budgeted costs be recouped. ARB received a loan of approximately $15.2 million from the Motor Vehicle Account (MVA) and was budgeted for approximately $8.5 million from the Air Pollution Control Fund (APCF).9 Cal/EPA also received a loan of approximately $300,000 from the MVA.

For the 2008/2009 fiscal year, most of the budgeted resources needed to implement the AB 32 program for ARB and Cal/EPA were provided through a $32 million loan from the Beverage Container Recycling Fund (BCRF). The loan was approved, with loan repayments spelled out in the Budget Act (AB 1781, Chapter 268, statutes of 2008). Table 2 illustrates the loan breakdown by fiscal year for ARB and Cal/EPA.

9 The funding from the Air Pollution Control Fund came from ARB and will not be repaid.

Table 2: ARB and Cai/EPALoans to Carry Out AB 32

Fiscal Year	Loans (Approximate, in Millions $)	
FY 2007/2008	(MVA loan, ARB)	$15.2
	(MVA loan, Cal/EPA)	$0.3
FY 2008/2009	(BCRF loan)	$32.0
Total		**$47.5**

ARB proposes to repay these loans over four years, beginning in the 2009/2010 fiscal year. Repayment of the three loans will include accrued interest. This proposed repayment schedule meets the statutory obligation for repayment, and is 'described in greater detail in Appendix C. Table 3 shows the proposed loan repayment schedule. If ARB expends funds from the loan approved by the legislature for fiscal year 2009/2010A, this repayment schedule will be modified to incorporate repayment of that loan.

Table 3: Proposed Loan Repayment Schedule

Payment Date	Approximate Repayment Amount' Including Interest (Million $)
June 30, 2010	$13.7
June 30, 2011	$14.0
June 30, 2012	$13.8
June 30, 2013	$13.2
Total	**$54.6**

[1]Does not add due to roundmg.

ARB Expenses for Fiscal Years *2007/2008* and *200812009*

In order to confirm that the funds loaned to ARB were expended on AB 32 related activities for fiscal years 2007/2008 and 2008/2009, staff reviewed the person years and other expenditures related to AB 32 in each fiscal year. This included the program staff workload associated with AB 32 work products, such as the Scoping Plan, various Early Action Measures, and additional regulatory measures. ARB utilized existing program staff, management oversight and program support staff, as needed, in order to complete the considerable workload within the statutory timeline.

Based on our initial evaluation of fiscal year *2007/2008* expenses, ARB expended resources in excess of the loan amount. Fiscal year *2008/2009* is still in progress, so the expenditures are preliminary, but similarly they show that ARB has expended resources in excess of the loan amount. With the proposed Fee regulation, ARB is proposing that only loan-related budgeted costs shown in Table 2 be recouped for prior fiscal years.

A summary of ARB's AB 32 expenditures for fiscal years *2007/2008* and *2008/2009* is provided in Tables 4 and 5 below. Additional detail is provided in Appendix C.

Table 4: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year *2007/2008*

	Costs (Million $)*
Staff Related Costs	
• Salary	$10.75
• Benefits	$3.77
• Operating Costs	$4.21
Program Oversight[1]	$2.00
Contracts[2]	$4.65
Equipment	$0.05
Total	$25.43

[1] Program Oversight includes Chairman's Office, Executive Office, administrative services and computer support expenses in proportion to the staffing for the AB 32 program.

[2] Estimated expenditures in the *2007/2008* fiscal year.

*Numbers do not add due to rounding

Table 5: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year *2008/2009* - Preliminary

	Costs (Million $)
Staff Related Costs	
• Salary	$16.10
• Benefits	$5.64
• Operating Cost	$7.54
Program Oversight[1]	$1.96
Contracts[2]	$5.92
Equipment	$1.83
Total	$38.99

1Program Oversight includes Chairman's Office, Executive Office, administrative services and computer support expenses in proportion to the staffing for the AS 32 program.
2Preliminary estimate of expenditures in the *2008/2009* fiscal year.

CaVEPA Expenses for Fiscal Years 2007/2008 and 2008/2009

Cal/EPA and ARB undertook a similar process to confirm that the Cal/EPA loans were expended on AB 32 related activities for fiscal years 2007/2008 and 2008/2009, reviewing the person years and other expenditures related to AB 32. Based on an initial evaluation of fiscal year 2007/2008 expenses, Cal/EPA expended resources in excess of the loan amount. Fiscal year 2008/2009 is still in progress, so the expenditures are preliminary estimates. However, combined with ARB's preliminary 2008/2009 expenditures, they show that the two agencies have expended resources in excess of the loan amount.

Like ARB, only funds loaned to Cal/EPA will be recouped by the fee for fiscal years 2007/2008 and 2008/2009. A summary of the expenditures is provided in Tables 7 and 8 below.

Table 7: Estimated Cal/EPA Expenditures for the AS 32 Program
Fiscal Year 2007/2008

	Costs[1] (Million $)
Staff Related Costs	
• Salary	$0.15
• Benefits	$0.08
• Operating Cost	$0.12
Contracts	0
Equipment	,0
Total	$0.34

[1]Does not add due to roundmg.

Table 8: Estimated CaVEPA Expenditures for the AS 32 Program
Fiscal Year 2008/2009 - Preliminary

	Costs (Million $)
Staff Related Costs	
• Salary	$0.34
• Benefits	$0.15
• Operating Cost	$0.30
Contracts	0
Equipment	0
Total	$0.79

Fiscal Year *2009/2010* Budget

In February 2009, the Legislature passed and the Governor signed the fiscal year 2009/2010 budget. This budget included a continuation of funding for ARB and Cal/EPA to carry out AB 32. For the 2009/2010 fiscal year, the Budget Act (SBX3 1, Chapter 1, Statutes of 2009) includes a $35 million loan from the BCRF for ARB and Cal/EPA expenditures related to AB 32. ARB will consider this fee regulation in June 2009, and if approved, fee collection for the 2009/2010 fiscal year will begin in spring 2010. Timely implementation of this fee regulation could eliminate the need for some or all of the loan for the 2009/2010 fiscal year. If ARB and Cal/EPA do rely on the loan for some or all of their 2009/2010 expenditures, the fee will be used to repay the loan with interest. These loan repayments would be added to the repayment schedule shown in Table 3, and extend final payment by one year.

Funding Criteria

AB 32 provides ARB with the authority to adopt fees for the broad purpose of "carrying out this division." For the 2009/2010 fiscal year and future fiscal years, ARB proposes to use the following criteria to determine which expenses would. be funded from this fee.

- Staff related expenditures for the start-up and ongoing implementation of the AB 32 program that have been approved through budget change proposals (BCPs) after AB 32 was signed into law (September 2006).
- Other post AB 32 BCPs approved costs directly related to the administration of AB 32 programs to reduce greenhouse. gas emissions, such as contracts, administrative overhead, and research directly related to the implementation of the AB 32 program.

For the 2009/2010 fiscal year and future fiscal years, ARB proposes that the following types of activities *not* be funded through AB 32 fees:

- Redirected staff positions working on AB 32 that were not approved in the formal budget process with an approved BCP;
- Costs incurred by non-state agencies such as air quality/pollution districts, other special districts, etc;
- Activities which are currently funding a part of an agency's principal responsibilities (water conservation, waste reduction; traffic planning, etc.) that achieve greenhouse gas emission reductions as a co-benefit;
- Specific greenhouse gas emission mitigation activities that started prior to the passage of AB. 32 or were covered by earlier budget requests;
- Activities related to adaptation to climate change, including adaptation-related research;

- Activities related to compliance with the California Environmental Quality Act (CEQA) requirements for state agencies related to climate change/greenhouse gas emissions; and,
- Compliance with existing and future programs, regulations or other initiatives for state agencies which reduce their own greenhouse gas emissions.

Funding for AB 32 Implementation in Fiscal Year *2009/2010* Budget

Several other state agencies have been working with Cal/EPA and ARB on AB 32 implementation, including work on the Climate Change Scoping Plan that ARB adopted in December 2008. The Scoping Plan describes a broad range of measures, including many measures that are the primary responsibility of other state agencies. These agencies, which all meet the funding criteria described above, include: the Department of Food and Agriculture, Energy Commission, Department of General Services, and Integrated Waste Management Board.

Table 8 below provides a preliminary summary of anticipated state agency expenses, including staffing levels, for the AB 32 program for the 2009/2010 fiscal year. Note that the numbers contained in the table are preliminary and subject to .change due to potential changes to the adopted 2009/2010 budget during the May revise. A final determination of the required revenue for fiscal year *2009/2010* will be made once final budget information becomes available. Additional detail is provided in Appendix C.

Table 8: Preliminary Summary of
AB 32 Program Funding for *FY2009/2010*

State Agency	PYs	Total Costs (in Million $)
Air Resources Board	155	$ 33.1
Integrated Waste Management Board	6	$ 1.3
Energy Commission	5	$ 0.6
Environmental Protection Agency	4	$ 0.7
Department of General Services	2	$0.2
California Department of Food and Agriculture	2	$ 0.3
TOTAL	174	$ 36.2

G. Ensuring Consistency with AB 32 Fee Authority

California law requires that a "nexus" must exist between a fee and the program funded by the Fee. If an adequate nexus does not exist, this Fee could be determined to be a tax. Health and Safety Code section 38597 specifically states that fees may be assessed on sources of greenhouse gas emissions regulated

pursuant to the division and consistent with Health and Safety Code section 57001.

Health and Safety Code section 38597 provides that ARB may adopt a regulation imposing fees on "sources of greenhouse gas emissions" regulated pursuant to AB 32. The proposed regulation imposes fees on upstream suppliers of natural gas and transportation fuels. Some stakeholders have argued that these upstream suppliers are not "sources" of greenhouse gas emissions within the meaning of section 38597, but that "sources" are the end users who actually burn the natural gas and transportation fuel (e.g., individual business, households, motorists, etc), and thereby directly emit greenhouse gases into the atmosphere.

ARB staff does not agree with this argument. Staff believes that the proposed regulation is consistent with section 38597 for the following reasons. First, some of the entities on which fees are imposed are clearly "sources" of greenhouse gas that are directly emitted into the atmosphere. These entities include refineries and cement producers (who generate process emissions from their operations) and facilities that burn coal. Stakeholders have not suggested otherwise.

Second, to address emissions from natural gas and transportation fuels, the proposed regulation is simply an administrative mechanism for efficiently collecting fees on downstream "sources" of greenhouse gas emissions based on the assumption that the costs of the fees will be passed on to downstream end users who actually combust the natural gas and transportation fuel.[10]

Gasoline and diesel fuels are burned by millions of individual motorists, as well as millions of individuals who operate small combustion sources such as construction and farm equipment, water pumps, lawn mowers, chainsaws, stoves and water heaters in homes, boats, off-highway all-terrain vehicles, snowmobiles and many others. Equipment that burns natural gas, gasoline, or diesel fuel is owned and operated by virtually every household and business in California. It would be inefficient, impractical and overly burdensome to impose fees on all of the individuals who own or operate such equipment. To do this, a fee would need to be imposed on essentially every person who resides in California.

H. Amendment to Mandatory Reporting Regulations

Additionally, this regulatory package proposes to amend the Mandatory Reporting Regulation. The Mandatory Reporting Regulation provides for reporting of GHG emissions electronically. The proposed amendment requires entities subject to the Mandatory Reporting Regulation to submit data via ARB's GHG Reporting Tool for ease of use and consistency in reporting.

10 Upstream suppliers of transportation fuels and natural gas are also "sources" of greenhouse gas emissions in the sense that they are in the business of placing a commodity into the stream of commerce that will ultimately result in greenhouse gas emissions.

III. Recommended Action and Alternatives to the Proposed Regulations

Recommended Action

To provide the funding authorized by Health and Safety Code section 38597, the staff recommends that the Board adopt the proposed AB 32 Cost of Implementation Fee Regulation. This would be put into effect by adopting new sections 95200 through 95207, title 17, CCR, as contained in Appendix A.

Evaluation of Regulatory Alternatives

California Government Code section 11346.2 requires ARB to consider and evaluate reasonable alternatives to the proposed regulation and provide reasons for rejecting those alternatives. This section discusses alternatives evaluated and provides the reasons why they were not included in the proposed rulemaking. No alternative considered by the agency would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective or less burdensome to affected private parties than the proposed regulation. .

A. No Action on AS 32 Cost of Implementation Fee

A "no action" alternative means that no fee would be assessed on sources of greenhouse gas emissions to cover the costs of carrying out the requirements of AB 32. Taking the "no action" approach would require that alternative funding sources be secured. It is unclear what these funding sources would be at this time. It is possible that in obtaining another source of funding, other projects would not be able to obtain funding, and/or the AB 32 climate change program would have to be diminished. This alternative was rejected as it is inconsistent with AB 32 and recent legislative intent.

S. No Action on Amendment to Mandatory Reporting of Greenhouse Gas Emissions Regulation

A "no action" alternative for amending the Mandatory Reporting of Greenhouse Gas Emissions Regulation means that the Mandatory Reporting Regulation would not be amended to require the use of the California Greenhouse Gas Reporting Tool (Tool) for data collection for the AB 32 Cost of Implementation Fee. Without the use of the Tool, the level of quality control and quality assurance that are possible with the Tool would be difficult to match. The Tool provides for automatic data check, and data security. Additionally, due to the ease of administration, the Tool reduces costs. Use of this "no action" alternative would result in a loss of these benefits.

C. Alternatives to this Broad-Based Fee Regulation

Staff considered analyzing each greenhouse gas-related regulation as it is developed, with the intent of adding a fee component to each regulation to cover costs required to carry out the goals of AB 32. However, this alternative would mean that ARB would not have the funds to start up each program and would need to b9rrow money to develop the regulation. Once the regulations were adopted, the Fee could cover the costs of carrying out the implementation of the regulation, but the borrowed money, including interest, would need to be repaid. This would increase costs, considering that each regulation would require borrowing money and repaying those loans with interest.

In addition, the complexity required for implementation of a regulation may not be proportional to the amount of emissions reductions.achieved by that regulation. This could create an equity issue, in that some regulations may only decrease a small amount of greenhouse gas emissions but require a large number of resources to develop and carry out the reduction of those emissions, while other regulations may achieve a relatively large amount of emissions reductions, but have lower costs due to a lowerlevel of complexity. In addition, every regulation would have an increased level of complexity due to the need to include the analysis to determine the appropriate fee levels required from each entity to cover the costs of carrying out the regulation. This would increase the cost of carrying out each regulation, thereby compounding total costs to affected entities, compared to the costs associated with the staff's proposed approach.

Furthermore, because California's greenhouse gas emission reduction program, as described in the Scoping Plan, includes regulatory measures that are not intended to be adopted by ARB, as well as non-regulatory measures, pursuing a regulation-by-regulation approach would mean that some sectors or source categories may not by subject to Fees while ARB-regulated sectors would have associated fees which would create inequity among the sectors.

D. Downstream Alternative

ARB staff considered assessing the Fee on the ultimate consumer of products that emit greenhouse gases. Underthis alternative, ARB would assess fees on residential, commercial, and industrial users of natural gas; the owners or operators of cars, trucks and other equipment that combust gasoline and diesel fuel; and the end-users of electricity. This general approach was rejected as being administratively infeasible.

For natural gas, the Fee would be assessed on residential, commercial and industrial users. Although the largest industrial users of natural gas are already reporting their greenhouse gas emissions under the Mandatory Reporting Regulation, this alternative would dramatically increase the number of points of assessment by including residential and commercial customers, increasing

record-keeping and collection costs. In addition, because the largest industrial users of natural gas would already be billed for their greenhouse gas emissions through the Mandatory Reporting Regulation, this downstream alternative adds a layer of complexity in that a method would need to be developed to extract their natural gas combustion quantities from the aggregate amount of natural gas reported by the public utility gas corporations. Without this extraction of data, the largest industrial users of natural gas would be billed twice for the same natural gas.

For gasoline, the Fee could be assessed at the pump but because the amount of the fee that is required to implement AB 32 is less than one-tenth of a cent per gallon, the purchase of ten gallons would generate a fee of only a penny, excessively increasing administrative costs. ARB also considered assessing the Fee at the "rack," formally known as the terminal rack. The rack is the location in the fuel distribution system where fuel is blended with oxygenates and other additives and then distributed to gas stations. Fuels that are imported into the state can be transported directly to racks and are therefore not accounted for at the refinery level. A fee at the rack would increase administrative burden by doubling the number of collection points - increasing the administrative burden while still being upstream of the end user.

For electricity, the Fee would be assessed at the consumer-level and would necessarily apply to all electricity consumed, whether generated in-state or out-of-state. This approach would apply the Fee to consumers of electricity without regard to whether that electricity was a source of greenhouse gas emissions or not, thereby adding an undue burden on some consumers. In addition, this option would tremendously increase the number of regulated entities, increasing administrative burden, and therefore administrative costs.

ARB chose not to pursue the downstream alternative due to the increase in administrative burden, increased record-keeping and fee collection costs, which would increase the overall cost of carrying out AB 32 mandates.

E. Alternatives Considered for Imported Electricity

ARB staff considered three alternatives to assessing a fee on imported electricity: no fee on imported electricity, assessing the fee on the suppliers of the electricity-generation fuels for out-of-state generation facilities, and assessing the fee on in-state electric retail providers.

No Fee on Imported Electricity - Staff considered the option of not applying the fee to imported electricity. However, this option was rejected because this would mean that sources of approximately 10 to 13 percent of California's greenhouse gas emissions would not be covered by the Fee, which would make the Fee regulation less equitable, increasing costs on remaining fee payers. Additionally,

at workshops held by ARB several stakeholders asked ARB to include imported electricity if at all possible.

Assessing the Fees on the Suppliers of the Electricity Generation Fuels for Out-of-State Generation Facilities - ARB considered applying the Fee to fuel suppliers for out-of-state generation facilities, as is proposed for in-state generation facilities. However, it is not possible for fees to be applied to out-of-state suppliers of electricity generation fuels, or to use the generation facility located out of state as the point of regulation, because California does not have jurisdiction over these entities.

Assessing a Fee Solely on In-State Electric Retail Providers - Assessing a fee solely on in-state electric retail providers, based on the imported electricity they use, would require that the retail provider identify the generating facilities that are the sources of the electricity. Each generation source has a distinct emissions factor. When the source is identified, ARB can then calculate a source emissions factor and accurately determine a fee rate. However, retail providers may not be able to identify the sources of electricity purchased from marketers, even though the marketers may have that information. In such cases, the emissions factor would be unknown, and a fee could not be accurately calculated. Therefore, by solely assessing fees on retail providers, some information would be lost, reducing the accuracy of the application of the Fee. Assessing the Fee on both the retail providers and the marketers results in fewer unspecified sources of electrical generation. The recommendation by the CEC and CPUC is to obtain such 'information from the first deliverer, which includes the marketers.

F. Expanding Coverage of Fee to Additional Sources

ARB staff considered expanding the Fee to cover the remaining 15 percent of greenhouse gas emissions. Staff rejected this alternative for three primary reasons. First, some of the greenhouse gas emissions that are not proposed to be covered under the Fee are fugitive emissions (such as methane emissions from dairy operations and landfills) that are difficult to accurately measure in order to assess an equitable fee. Second, some types of emission sources (such as jet fuel and kerosene) contribute a small proportion of greenhouse gas emissions, so the administrative burden of including those emissions outweighs the potential increase in revenue. Third, staff opted not to pursue a fee on high GWP gases because there is already a regulation planned to assess mitigation fees on high GWP gases, which is expected to be considered by the Board within the next year. Some portion of the high GWP fee will be dedicated to program implementation costs, and the high GWP mitigation program will be administratively self-supporting.

IV. Impacts Analysis

The California Environmental Act (CEQA) and ARB policy require an analysis of the potential adverse environmental impacts of proposed regulations. The Secretary of Resources has certified ARB's program for the adoption of regulations. Public Resources Code, Section 21080.5, allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report, once the Secretary for Resources has determined that ARB meets the criteria for a Certified State Regulatory Program (Title 14, California Code of Regulations (CCR) section 15251 (d». This certification allows ARB to include an environmental analysis in the Initial Statement of Reasons for the adoption of regulations, instead of preparing Negative Declarations or Environmental Impact Reports (EIRs). In addition, ARB will respond in writing to all significant comments that pertain to potential environmental impacts raised by the public during the public review period or at the Board hearing. These responses will be contained in the Final Statement of Reasons for the regulation.

ARB's basis' for analysis originates from the CEQA Guidelines' Initial Study Checklist. The following environmental impact areas were considered in making the determination of whether the adoption and implementation of the proposed regulation would result in a potential adverse impact:

A. Impacts to Air Quality and Other Environmental Impact Areas

Staff evaluated the potential environmental impacts from the proposed Fee regulation and the proposed amendment to the Mandatory Reporting Regulation and determined that no potential significant adverse environmental impacts to air quality or any other environmental impact area would result from the proposed regulations. The proposed Fee regulation simply assesses fees on various entities. The proposed amendment to the Mandatory Reporting Regulation would require the use of ARB's reporting tool. Neither would cause a physical change to the environment, directly or indirectly. It would not result in the disturbance or conversion of land, cultural, biological or water resources, increase energy demand, affect populations or increase the need for housing. It will not result in a change in existing transportation or in traffic, solid waste or affect the aesthetics of the State.

B. Environmental Justice

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Senate Bill 115, Solis; Statutes of 1999, CH. 690; Government Code section 65040.12 (c». On December 13, 2001, the Board approved

Environmental Justice Policies and Actions that establish a framework for incorporating environmental justice into ARB's programs, and that would be consistent with the directives of State law. The policies subsequently developed apply to all communities in California. Staff has determined that the proposed regulation and the proposed amendment would not result in an adverse impact to air quality, thus would not result in an increase in exposure to pollutants.

Adoption and implementation of this regulation will have no adverse environmental impacts on environmental justice communities. Staff believe the economic impacts will be extremely minor. The cost per person would be approximately $1.00 to $1.50 per year, or $4.00 per household per year, assuming that the fee payers pass all their costs through to their customers.

V. Economic Impact Analysis

A. AS 32 Cost of Implementation Fee Regulation

In this section, ARB provides estimates of the costs to businesses of compliance with the staff's proposed fee regulation. ARB expects the regulation to directly affect approximately 230 businesses in the state. While staff has quantified economic impacts to the extent feasible, the cost estitnates are based on historical data of industry-level emissions, fuel use, and commodity prices that are all highly variable. In addition, all calculations are based on. current budget levels that may be changed by the Legislature. Consequently, the staff acknowledges that individual companies may experience different impacts than. those depicted for each industry in this analysis.

The analysis begins with an explanation of how fee rates are based on reported emissions and annual budget levels. ARB will use its annual budgeted revenue requirement and emissions reported by fee payers to calculate a Common Carbon Cost per ton of emissions on a C02 equivalent basis (MTC02E). Each company's fee obligation is based on the Common Carbon Cost and the company's reported emissions and fuel distributions.

The analysis then examines the estimated distribution of the fee payments by industry. These payments represent the direct impacts on businesses. The analysis then assesses how the directly impacted businesses may try to recover the costs through output price increases.'

S. Annual Cost of the AS 32 Cost of Implementation Fee Regulation

Assuming the Legislature continues to authorize AB 32 activities at fiscal year 2009/2010 budget levels, the regulation is expected to raise approximately $51.2 million annually over the first three years of its operation, and about $50.2 million in its fourth year. This level would cover $36.2 million in annual program costs af fiscal. year 2009/2010 budgeted levels and repayment of loans from special funds to support implementation of climate change programs by ARB and Cal/EPA in previous years. After the loans are repaid, the regulation would raise approximately $36.2 million annually unless modified by the Legislature.

The Common Carbon Cost is determined by dividing the Total Revenue Requirement by total covered emissions, which includes the carbon content of covered fuels. The fees charged to each source will equal the Common Carbon Cost multiplied by the amount of the business' emissions. Table 9 demonstrates the calculation using emissions inventory data for 2006. Had the fee regulation been in effect in 2006, the emissions covered by the fee would have been about 412 million metric tons, in CO_2 equivalent. In this case, the Common Carbon

Cost per ton of emissions to cover only the $36.2 million annual ongoing cost would be about $0.09 per MTC02. The Common Carbon Cost per ton of emissions to cover the annual ongoing cost plus loan repayment would be about $0.12 per MTC02E. The Common Carbon Cost would be recalculated each year based on budgeted revenue requirements and the amount of covered emissions.

Table 9: Sample **Calculation of Common Carbon Cost**
Based on Fiscal Year 2009/2010 Estimated Expenditures

	Units	Annual Ongoing Costs Only	Annual Ongoing Costs Plus-Loan Repayments
Revenue Requirement	Million $	$36.2	$51.2
Covered Emissions (2006)	MMT	412	412
Common Carbon Cost	$/MTC02	$0.0880	$0.1244

Source: ARB calculations.

C. **Affected Industries by Sector**

Table 10 presents estimates of the fee payments by sector. The first two columns contain the entities directly paying the Fee and their respective emission quantities in 2006. The fourth column presents the costs over the first four years of the program based on the assumption that all ARB and Cal/EPA loans are paid over that period. After the loans are repaid, the payments are based on the annual ongoing budgeted cost of $36.2 million per year, as presented in column three. The estimated fee payment by source sector is calculated by multiplying the quantity of emissions subject to the fee by the Common Carbon Cost given in the last row of Table 10. The fifth column contains the estimated share of total revenue for each source sector.

Table 10: **Affected Industries By Sector**
Example using 2006 Emissions Data and
Fiscal Year *2009/2010* Estimated Expenditures

		Estimated Fee Payments		
Sector	**2006 Emissions** Million $MTCO_2$	**Annual Ongoing Costs Only** Million $	**Annual Ongoing Costs Plus Loan Repayments** Million $	**Share of Costs by Emissions Source** %
Refinery Process Emissions	33.92	$2.98	$4.22	8.2
Gasoline	143.38	$12.61	$17.84	34.8
Diesel	42.84	$3.77	$5.33	10.4
Natural Gas	124.53	$10.95	$15.49	30.2
Associated Gas	3.24	$0.28	$0.40	0.8
Cement	8.39	$0.74	$1.04	2.0
Non-Cement Coal Use	5.74	$0.50	$0.71	1.4
Electricity Imports	49.64	$4.37	$6.17	12.1
Total	411.67	$36.21	$51,21	100.0
Common Carbon Cost	*$/MTC02*	$0:0880	.$0.1244	

Note: Emissions data from 2006 ARB Emissions Inventory, all other entries based on ARB calculations.

Table 11 presents estimates of the number of businesses in each of the sectors expected to pay the proposed Fee. Businesses may operate more than one facility. Column three contains the average Fee payment for businesses by source for the first four years of the Fee, when the payment rates cover loan repayments. Column four contains the average payment for subsequent years after the loan repayment is complete. All annual cost figures assume a constant ongoing budget requirement of $36.2 million per year.

Table 11: Estimated First Year and Ongoing Costs Per Business

Source	Estimated Number of Businesses Number	Estimated Average Annual Cost for First Four Years Million $	Estimated Average Annual Ongoing Costs Million $
Cement	5	$0.21	$0.15
Refineries	21	$1.32	$0.94
Associated Gas	11	$0.04	$0.03
Electricity Imports	130	$0.05	$0.03
Non-Cement Coal	14	$0.05	$0.04
Natural Gas Direct Use and Distribution	50	$0.31	$0.22
Total	231		

Source: ARB estimates
Assumes Fiscal Year *2009/2010* Expenditures are constant

The estimate in Table 11 of the number of businesses in the electricity imports. category is based on the number of businesses defined as retail providers and marketers of imported electricity that are active in California. This number could change from year to year.

The estimates in Table 11 are based on emissions inventory data for 2006. Since the regulation is designed to raise a fixed amount of budgeted revenue, a decrease in industry output and consequent emissions due to the current recession would have the effect of raising the Common Carbon Cost. This, in turn, would raise the cost of the Fee per unit of output. Similarly, prices in most of the sectors paying the Fee are highly variable, and ARB recognizes the fee impacts are sensitive to changes in those prices.

D. Mandatory Use of Greenhouse Gas Reporting Tool

The proposed regulation would also require entities subject to the Fee to use ARB's Greenhouse Gas Reporting Tool when reporting emissions or other information used for calculating the Fees. The Reporting Tool is a web-based platform designed to facilitate reporting and ease the administrative burden on respondents and ARB. A comprehensive users' guide, sector-specific reporting guidance, and other training aids will be provided. The use of the tool reduces the need for entities to develop their own reporting methods for this regulation, and lessening the possibility of reporting errors.

Entities already subject to the Mandatory Reporting of Greenhouse gas Emissions Regulation would not incur significant costs to use the Reporting Tool for compliance with this fee regulation. These entities include cement producers,

facilities combusting coal, oil producers combusting associated gas, refineries, electric utilities and marketers importing electricity, and natural gas producers and'pipeline owners and operators. Some entities complying with the Reporting regulation for their direct emissions would have to augment their reports for the fee regulation with data on fuel distribution, but this should not represent a significant additional cost. These entities include refineries and natural gas pipeline owners and operators.

There would be some entities not currently required to comply with the Reporting Regulation that would be required to pay fees and use the Reporting Tool for reporting their data for fee ,calculation purposes. These would include interstate pipeline owners and operators, non-public utility gas corporation intrastate pipeline owners and operators, and transportation fuel importers without direct emissions above the Reporting threshold. These entities would only need to report their fuel throughput and any direct emissions, which should only involve insignificant costs

E. Economic Impact of AS 32 Fees

ARB expects that most businesses paying the Fee have the ability to pass the Fee costs through to consumers. The demand for gasoline and diesel is inelastic and the carbon-content portion of the Fee is also assessed on imported fuel, so the refiners should have the ability to pass on Fee costs. Although imported transportation fuels do not bear the cost of process emission fees, these are a small percent of the total. Because the Fee will affect providers of gasoline and diesel fuel in substantially the same way, ARB believes that the Fee will likely be passed, on to customers.

Electricity importers, cogeneration facilities, and natural gas-fired power plants should be able to pass the Fee cost on to the load-serving entities. The load-serving entities can then recover the passed-through Fee costs as a price increase over all of their deliveries. ARB believes that imposition of the Fee is too small to affect wholesale market dispatch.

Charging the Fee on the burning of associated gas in petroleum production would raise the cost of producing petroleum in California. In 2006, California produced about 249 million barrels of oil. If the 2006 emissions and oil production rates prevail when the Fee is applied the fee would amount to about $0.002 per barrel,equal to less than 0.1 % of recent prices. ARB does not know if all petroleum producers burn associated gas or whether each company's combustion is proportional to its oil output. If companies do not combust associated gas in'the same relation to output then the Fee cost per barrel for some of those paying the Fee would be higher than ARB's estimate.

California both produces and imports oil. The presence of imports may limit the ability of the oil producers to pass the full Fee costs on to the refineries. In

addition, ARB cannot determine the covered emissions for entities combusting associated gas, so ARB is unable to determine the financial impact of the regulation on individual companies expected to pay the Fee. However, the average Fee cost per barrel produced appears to be very low at the industry level, and ARB does not consider it likely to have a significant adverse economic impact on oil producers.

The amount by which cement producers would need to raise their prices is very small,estimated to be about $0.10 per ton, or less than 0.2% of recent prices. The ability of cement manufacturers to pass on the Fee costs may also be limited by the availability of imports. Unlike transportation fuels, natural gas, and electricity, the Fee would not be assessed on imported cement and cement products. The presence of significant import supply on which the Fee is not assessed could limit the ability of California cement manufacturers to pass on the entire Fee cost to consumers of cement.

ARB has evaluated the impact of the Fee on cement manufacturing companies' profitability assuming that the cement companies are not able to pass on any of the Fee costs. Generally, ARB uses the return on equity (ROE) as a measure of a company's profitability. ARB has determined that even if cement manufacturers are unable to pass on any of the Fee cost, the reduction in their profitability would be less than a 1 percent decrease in ROE. ARB believes the parent companies of California plants are sufficiently large so that the costs will not significantly affect profitability, even in the unlikely case that cement plants cannot pass on any of their Fee costs.

Businesses not directly paying the Fee would face higher costs as producers directly paying the Fee pass on the fee costs. However, as shown in Table 12, these price increases to be very small. ARB has determined that these indirect cost increases will not have a significant adverse economic impact on businesses and individuals.

F. Potential Impact **on Consumers**

ARB expects that businesses paying the Fee will recover most of the cost of the fee by raising output prices. Table 12 presents estimates of the increase in output prices needed for businesses to completely recover the fee over the first four years of the regulation, when previous loans are repaid. Column five presents the Fee cost per unit of output. In some cases, the businesses producing products listed in Table 12 pay fees on more than one of the sources listed in Table 10. For example, the combined fees assessed on electrical generation and delivery, including coal for cogeneration, natural gas, and imported electricity totals about $0.05 for each MWh consumed in California. Electricity load-serving entities would need to raise their average retail price by that amount to recover the combined fee, equal to about 0.04% of the 2006 retail price of $120 per MWh.

Table 12: Estimated Change in Output Prices
Needed to Recover Fee Payments

Product	Units	Product Price $/Unit	Number of Units (2006) Units	Fee Cost per Unit of Output $/Unit	Percent Change in Product Price %	Revenue Million $
Electricity	MWh	$120.00	269,271,000	$0.0495	0.04	$13.32
Gasoline	Gallons	$2.20	15,974Billion	$0.0013	0.06	$21.50
Diesel	Gallons	$2.20	4,182 Billion	$0.0015	0.07	$6.29
Non-Electricity Natural Gas	Therms	$1.24	130,600,000	$0.0007	0.05	$9.06
Cement	MT	$75.00	11,500,000	$0.0907	0.12	$1.04
Total						$51.21

NOTES
1. Electricity and natural gas data from California Energy Commission.
2. Cement data based on industry estimates.
3. Gasoline and diesel quantities based on data reported to ARB.
4. Coal is incorporated in electricity and cement products.

In the same manner, the cost estimates for gasoline and diesel include the fees assessed on their carbon content as well as fees assessed in their production, such as associated gas and process emissions. Note that the associated gas fee is levied at the point of production, but for the purposes of estimating the potential impact on consumers the calculations in Table 12 the assumption is made that the Fee is passed on to the refinery as part of the cost of petroleum production. The Fee costs on associated gas are then reflected in the price of gasoline or diesel. The cost estimates for ,cement include both coal combustion and process (clinker) emissions. The cost estimate for natural gas combustion in Table 12 covers only non-electricity uses.

VI. Summary and Rationale for Proposed Regulations

The proposed AB 32 Cost of Implementation Fee Regulation would assess fees on approximately 85 percent of the sources of greenhouse gas to support implementation of the Global Warming Solutions Act of 2006, Assembly Bill 32, Chapter 488, Statutes of 2006 (AB 32). The fees would be assessed on sources of greenhouse gas, with each fee being calculated separately for each source. This section discusses the requirements and rationale for each provision of the proposed regulations.

The proposed amendment to the Mandatory Reporting of Greenhouse Gas Emissions regulation requires operators and verifiers subject to the Mandatory Reporting regulation to use ARB's reporting tool.

A. Proposed AS 32 Cost of Implementation Fee Regulation

Section 95200. Purpose.

Summary of Proposed Regulation.

This section states the purpose of the regulations. Specifically, pursuant to Health & Safety Code section 38597, the Board is adopting this Fee schedule to collect fees to carry out AB 32.

Rationale for Proposed Regulation.

This section is needed to ensure the regulated public understands that fees generated from these regulations will be used for implementation of programs pertinent to AB 32.

Section 95201. Applicability.

Summary of Section 95201 (a).

Subsection (a) of the proposed regulation outlines that the fees will be imposed on the category of sources stated in subsections (a)(1) through (a)(6).

Rationale for Section 95201 (a).

This section is required in order to identify the entities to which this regulation would apply.

Summary of Section 95201(a)(1), Natural Gas Utilities and Users.

Subsection (a)(1) addresses natural gas utilities and users. A fee is assessed on each therm of natural gas: (1) delivered to any end user in California by a public utility gas corporation (defined in section 95202subsection (a)(70)), (2) owners and operators of interstate and intrastate pipelines that distribute natural gas directly to end users in California, (3) all owners or operators consuming natural gas or associated. gas produced on-site that are subject to the Mandatory Reporting Requirements of Title 17, California Code of Regulations sections *95100 et seq.* ("Mandatory Reporting Requirements."), and (4) owners and operators that consume associated gas that is produced on-site and are subject to the· Mandatory Reporting Regulation.

Rationale for Section 95201 (a)(1).

This section is necessary for two reasons: the first is to include natural gas Litilities, users and pipeline owners and operators that distribute natural gas for use in California because combustion of natural gas is responsible for 26 percent of greenhouse emissions in California. The second reason is that it is necessary to define where in the chain of commerce the Fee will be assessed and address each and every natural gas producer or consumer at the most upstream point possible for natural gas utilities, users and pipeline owners and operators that distribute natural gas for use in California. As explained elsewhere in this report, ARB considered several alternative methods of assessing the Fee. Assessing the Fee at the most upstream point possible was determined to be the most economically feasible, while the costs of the Fee could be passed through to the ultimate consumer of natural gas.

Summary of Section 95201 (a)(2), Producers and Importers of Gasoline and Diesel Fuels.

Subsection (a)(2) outlines that the Fee would be assessed on: (1) all producers and importers of California gasoline or California diesel, based on the number of gallons of gasoline or diesel fuel, and (2) all producers and importers of CARBOB, based on each gallon of CARBOB plus the designated oxygenate amount.

Rationale for Section 95201 (a)(2).

It is necessary to include transportation fuels such as gasoline and diesel fuel because emissions from combustion of transportation fuels contribute 38 percent of the greenhouse gas emissions in California. This section is necessary to define the scope of the Fees assessed on producers and importers of gasoline and diesel. Each subsection is necessary to address a separate sector of transportation fuel producers and importers

Summary of Section 95201 (a)(3), Refineries.

Subsection (a)(3) proposes to impose a fee on all owners or operators of refineries that emit process emissions, including refineries that produce or consume catalyst coke, petroleum coke, refinery gas or produce emissions that result from the steam methane reforming process. The Fee will be based on reported emissions.

Rationale for Section 95201 (a)(3).

It is necessary to include these refineries because the process emissions produced are sources of greenhouse gases and must be included in the Fee base to ensure the widest possible base of Fee payers.

Summary of Section 95201 (a)(4), Cement Manufacturers.

Subsection (a)(4) proposes to impose a Fee on cement manufacturing facilities that emit greenhouse gases. The Fee will be based on reported emissions.

Rationale for Section 95201 (a)(4).

It is necessary to include these refineries because the process emissions produced are sources of greenhouse gases and must be included in the Fee base to ensure the widest possible base of fee payers.

Summary of Section 95201 (a)(5), Retail Providers and Marketers of Imported Electricity.

Subsection (a) (3) proposes to impose a Fee on retail providers or marketers of imported electricity. The Fee will be paid based on the greenhouse gas emissions associated with each Megawatt-hour of imported electricity.

Rationale of Section 95201 (a)(5)

It is necessary to include importers of electricity ,because the out-of-state generation of electricity to supply California consumers results in greenhouse gas emissions. These emissions must be included in the Fee base to ensure the widest possible base of fee payers. This method will result in a fee that is equitable to that proposed to be assessed on in-state electricity, however the method is different because ARB does not have the authority to regulate providers of fuel to electricity generators located out-of-state

Summary of Section 95201 (a)(6), Facilities that Combust Coal.

Subsection (a)(5) proposes to impose a Fee on the combustion of coal in California if the owner or operator of the combusting facility is subject to the Mandatory Reporting Requirements. The Fee will be based on reported emissions.

Rationale for Section 95201 (a)(6).

It is necessary to include these facilities that combust coal because the emissions produced are sources of greenhouse gases and must be included in the fee base to ensure the widest possible base of fee payers.

Summary of Section 95201(b)(1) through (9).

Subsection (b) proposes to exclude greenhouse gas emissions caused by combustion of certain fuels (aviation gasoline, jet fuel, kerosene, liquefied . petroleum gas, biodiesel, renewable diesel, residual fuel oil, propane and fuel exported for use outside California) from the Fee.

Rationale for Section 95201(b)(1) through (9).

These fuels are excluded because the total greenhouse gases emitted by these sources is too small a portion of the greenhouse gas inventory to capture and the points of regulation are too numerous (potentially in the tens of thousands) to administer in a cost effective manner.

Section 95202. Definitions.

Summary of Section 95202

This section proposes definitions to the terms used in this regulation.

Rationale for Section 95202.

It is necessary that ARB defines its terms as they apply to the AB 32 Cost of Implementation Fee Regulation. Most of these terms are used in other Articles and Titles in the California Code of Regulations, Government Code sections or statutes, and it is necessary that ARB be consistent with existing definitions to the extent that they apply to this regulation.

Section 95203. Calculation of Fees.

Summary of Section 95203(a), Total Required Revenue QRR).

This subsection proposes to define the elements that will compose the annual Total Required Revenue. The Total Required Revenue (TRR) shall include Required Revenue plus any shortfalls or excesses from the previous fiscal year. The Required Revenue will be based on the number of personnel positions and contracts approved in the California budget for each fiscal year for all agencies implementing AB 32. The TRR must also include payments required to be made by ARB for loans obtained in implementing AB 32 within ARB for the *2007/2008* and *2008/2009* fiscal years. Repayment of the loan for *2008/2009* is required by Assembly Bill 1781 , Chapter 268, Stats. 2008, page 309.

Rationale for Section 95203(a).

This section is needed to define the total amount of money that ARB will collect on an annual basis, and so the regulated public will be able to accurately compute the cost of the efforts of state agencies implementing AB 32. Inclusion of the debt is necessary because it is required by AB 1781 as a debt to be repaid. ARB has no other means of raising funds to pay down the debt, as required by law.

Summary of Section 95203(b), Common Carbon Cost (CCC).

This section proposes a formula to calculate the fees that will be paid by the entities defined in Section 95201. First, a "common carbon cost" or "CCC" will be calculated, which will be a unit cost of each metric ton of carbon dioxide ($MTC0_{2)}$. This cost will be determined dividing the TRR by' the proportion of greenhouse gas emissions

Rationale for Section 95203(b).

This section is necessary to calculate the cost of each $MTC0_2$. The CCC is the basis for the calculation of Fee rates which allow the Fee to be applied equitably to all sources of emissions subject to this regulation.

. Summary of Section 95203(c), Fuel Fee Rate.

This section proposes to calculate a Fuel Fee Rate for emissions from combustion of natural gas, motor vehicle fuels and coal. The Fuel Fee Rate is multiplied by the CCC calculated in section 95203(b) and the emission factor of each fuel.

Rationale for Section 95203(c).

This section is necessary to describe how to calculate a fee for each fuel instead of using the same fee for each fuel. Each fuel has a different emission factor because each fuel has different carbon dioxide emissions, and so the Fuel Fee Rate must be calculated separately.

Summary of Section 95203(d), Fuel Emission Factors.

This section describes the source of the emission factors to be used for calculating the CCC as required in section 95203 (b), and the Fuel Fee Rate as required in section 95203 (c).

Rationale for Section 95203(d).

This section is necessary to describe the specific emission factors to be used for purpose of the fee calculation described in this regulation

Summary of Section 95203(e), Imported Electricity Fee Rate.

This section proposes to calculate an Imported Electricity Fee Rate for specified and unspecified sources of electricity imported into California. The Electricity Fee Rate for each specified source is calculated by multiplying the CCC by the emission factor of the specified source. For unspecified sources, the Electricity Fee Rate is calculated by multiplying the CCC by the default emission factor for unspecified sources.

Rationale for Section 95203(e).

This section is necessary to calculate the Electricity Fee Rate per MWh of imported electricity based on the emissions associated with combustion of fuels to generate the imported electricity. This "two pronged" approach is necessary to ensure that each source of imported electricity pays its portion of the Fee, while also accounting for the different types of electricity imported into California. Additionally, ARB needs to assess the Fee on as many contributors of greenhouse gas emissions as possible. Through this methodology, the impact of the Fee on imported electricity is equivalentto the impact of the Fee on in-state electricity generation, because in both cases, the Fee is based on the quantity of emissions from combustion of fuels used for generation., For in-state generation, the Fee is assessed upstream directly on the fuel used to generate the electricity, and the cost of the Fee is expected to be passed on to the generator, and ultimately to the consumers of electricity.

Summary of Section 95203(f), Emissions Factors for Generating Units or Facilities of Imported Electricity

This section proposes to calculate emission factors for specified sources of imported electricity that are generating units or facilities. Emission factors are calculated by dividing the source's CO_2 emissions by. the source's electricity generation output.

Rationale for Section 95203(f).

This section is necessary to calculate the emission factors that are used to calculate Electricity Fee Rates for imported electricity from specified sources that are generating units or facilities. Specified sources have emissions factors that can be easily ca.lculated by using data that they report either to ARB, under the Mandatory Reporting Regulation, to the U.S. Environmental Protection Agency, or to the federal Energy Information Administration

Summary of Section 95203(g), Emissions Factors for Asset Owning/Controlling Suppliers

This section proposes to calculate emission factors for specified sources that are asset-owning or asset-controlling suppliers, and to assign an emission factor for

unspecified sources of imported electricity. Emission factors for asset-owning and asset-controlling suppliers are calculated as total emissions from generation of electricity that makes up the supplier's portfolio of electricity supply, divided by the total quantity of electricity in MWh. This section assigns the default emission factor of 0.499 MTC02 per MWh to electricity imported from un"specified sources.

Rationale for Section 95203(9).

This section is necessary to calculate the emission factors that are used to calculate Electricity Fee Rates for imported electricity from asset-owning and asset-controlling suppliers, and to assign a default emission factor for imported electricity from unspecified sources. The suppliers emission factors can be calculated by using data that they report either to ARB, under the Mandatory Reporting Regulation, to the U.S. EPA, or to the federal EIA. However, unspecified sources, which cannot be matched to a particular generating facility or group of facilities, also contribute a portion of California's electricity whose generation results in greenhouse gas emissions. These sources can only be captured by assigning an emission factor. The assigned emission factor is that recommended by the CPUC and the CEC for use in the reporting and verification of greenhouse gas emissions.

Summary of Section 95203(h), Fee for Fuels.

This section proposes to calculate the Fee for fuels supplied, consumed or produced based on the quantity of fuel supplied, consumed or produced. The Fee charged will be the fuel rate, (calculated in section 95203(c» multiplied by the quantity of fuel supplied, consumed or produced based on the reporting requirements of section 95204.

Rationale for Section 95203(h).

This section is necessary to calculate an individual entity's Fee for the fuels supplied, consumed or produced. To this point, ARB has calculated the cost of " each $MTC0_2$, then the cost per $MTC0_2$ for each fuel source of greenhouse gas emissions. This final calculation for fuels will be the basis of ARB's recovery of funds allowed by HSC 38597.

Summary of Section 95203(i), Fee for Imported Electricity.

This section proposes to calculate the Fee for retail providers and marketers that import electricity based on the amount of electricity imported from each specified or unspecified source. The Fee charged will be the Electricity Fee Rate (calculated in section 95203(e» multiplied the quantity of electricity imported, for electricity that a retail provider or marketer imports from each specified or unspecified source.

Rationale for Section 95203(i).

This section is necessary to calculate the Fee for each retail provider and marketer that imports electricity. To this point, ARB has calculated the cost of each $MTCO_2$, and the Electricity Fee Rate per MWh of imported electricity. This final calculation will be the basis of ARB's recovery of funds.

Summary of Section 95203(j), Fee for Entities.

This section proposes to calculate the Fee for stationary sources based on the total number of $MTCO_2$ emitted and reported on an annual basis. Specifically, the CCC is multiplied by the total amount of process emissions associated with the stationary source.

Rationale for Section 95203(j).

This section is necessary to calculate the Fee for the stationary sources that emit process emissions that are greenhouse gases. The process emissions of each source are already reported pursuant to the Mandatory Reporting Requirements. The process emissions of each source are already reported pursuant to the Mandatory Reporting regulation or other requirements. It cannot be calculated in the same manner as the fuel calculation because process emissions are an additional source of greenhouse gases but are emitted in a different manner. Additionally, process emissions may be sold elsewhere as a fuel, which would result in overcharging 'an entity.

Section 95204. Reporting and Recordkeeping Requirements.

Summary of Section 95204(a) and (b), Reporting Format.

This section requires all reports to be submitted to ARB by using ARB's GreenhouseGas Reporting Tool. It also specifies the information each entity is required to report.

Rationale for Section 95204(a) and (b).

The information must be submitted to ARB so that ARB may calculate the appropriate fees, as required by Health and Safety Code section 38597 and other provisions of these regulations.

Summary of Section 95204(c), Timeline for Reporting.

This section stipulates the date entities must annually report to ARB.

Rationale for Section 95204(c)

This information must be submitted to ARB by the reporting date so that ARB is able to calculate the appropriate fees by January 30th of the following calendar

year and so it is consistent the with the reporting date in the Mandatory Reporting Regulation.

Summary of Section 95204(d) through (i)

These subsections require the various entities included in these regulations to report information to ARB. Specifically, the regulated natural gas entities report the quantity of therms of natural gas transported, purchased or consumed, as applicable. These reporting requirements are consistent with requirements in Article 2, title 17 of the California Code of Regulations. Producers and importers of motor vehicle fuels must report the total amount of each variety of fuel sold for use in California, entities subject to the Mandatory Reporting Requirements which combust coal must report the total number of tons and the grade of coal combusted, marketers and retail providers that import electricity must report MWh of imported electricity, refineries must report the quantities of process emissions produced, oil field operators that produce associated gas must report quantities of emissions from onsite combustion of the associated gas, and cement manufacturers must report the total process emissions resulting from their operations. Wherever possible, entities that already report information to another agency or pursuant to the Mandatory Reporting Requirements only need to submit the same information to ARB.

Rationale for Sections 95204(d) through (i).

This information is necessary for ARB to accurately calculate the Common Carbon Cost and subsequently collect the Fee required by Health and Safety Code section 38597.

Summary of Section 952040), Records Retention.
This section requires entities to maintain copies of the information provided pursuant to this article, and to make this information available to representatives of ARB within 5 business days upon request.

Rationale for Section 95204(j)
This requirement is necessary in case any discrepancies or questions arise following report submittal.

Section 95205. **Payment and Collection.**

This section proposes the payment schedule of fees assessed by these regulations. Fees will be assessed annually, based on the calendar year. Within 30 days of the end of the calendar year, ARB's Executive Officer will calculate the fee owed by each affected entity and provide the fee calculation in writing to the affected entity. This Fee will be based on reports submitted pursuant to section 95204. Each entity will have 60 days from the receipt of the Fee Determination Notice to remit the fees to ARB. If an entity fails to send the payment to ARB within the required 60 days, late fees will be assessed. Fees

recovered shall only be used for recovering costs of implementing the provisions of AB 32 and repaying the debt incurred for previous fiscal years.

Rationale for Section 95205.

This section is necessary to describe how payments will be made. Specifically, it has been ARB's experience that ARB needs 30 days from the end of the calendar year to calculate the fee to be assessed. Additionally, absent the 60 day remittance time, ARB would possibly run out of money to implement AB 32 programs.

Section 95206. Enforcement.

This se'ction proposes the penalties and consequences of not complying with these regulations. These provisions include penalties pursuant to Health and Safety Code section 98580. The failure to submit a required report or pay the fee assessed constitutes a single and separate violation for each day the report is not submitted or the fee is not filed. This section also gives ARB authority to contract with other state agencies or third parties to obtain data or audit information submitted by regulated entities. This section allows ARB to designate other parties to enforce the regulation.

Rationale for Section 95206.

Section 95206 (a) and (b) merely restate existing law. This is necessary to inform the public what the penalties will be for noncompliance with the regulation and to direct the public to the appropriate statutes to determine the penalties. Subsections (c) and (d) are authorized pursuant to Health and Safety Code section 38580(b)(3) and necessary in this instance to ensure compliance with the regulation, as well as to ,deter misrepresentation of data submitted. Additionally, subsections (c) and (d) encourage the correction of mistakes as soon as possible. Subsections (e) and (f) are necessary because ARB needs to be allowed to contract with third parties in certain circumstances due to ARB's limited resources for auditing and enforcement purposes.

Section 95207. Severability.

This section ensures that if one provision of the regulations is declared invalid by a court or other authority, the remaining provisions will remain in full force and effect.

Rationale for Section 95207.

this section is necessary to ensure that if ARB has enacted a provision in the proposed regulatory article that is illegal or unconstitutional the remaining regulatory provisions remain intact.

B. Proposed Amendment to the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

Section 95104(e). Greenhouse Gas Emissions Data Report.

This section requires that all operators and verifiers, subject to the Mandatory Reporting Regulation, use ARB's Greenhouse Gas Reporting Tool to report the data specified in sections 95103 through 95133 to ARB.

Rationale for Section 94104(e).
This section is needed to ensure that all operators and verifiers use the Greenhouse Gas Reporting Tool to report emissions data to ARB which will help lessen the possibility of reporting errors.

VII. References

California Air Resources Board. (2009). *Article 2 Title 17, CCR Regulation for the Mandatory Reporting of Greenhouse Gas Emissions.* Retrieved January 2009, from http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm

California Air Resources Board. (2008). *Climate Change Scoping Plan: A Framework for Change.* Released October, 2008, retrieved from http://www.arb.ca.gov/cc/scopingplan/documentlscopingplandocument.htm

California Air Resources Board. (2006). *Greenhouse Gas Emissions Inventory.* Retrieved January 2009, from http://www.arb.ca.gov/cc/inventory/doc/doc.htm

California Air Resources Board. (2004). *Proposed Amendments to the California Diesel Fuel Regulations, Final Statement of Reasons.* Retrieved January 2009, from http://www.arb.ca.govlregactlulsd2003/fsor.pdf

California Air Resources Board. (2000). *Proposed California Phase 11 Reformulated Gasoline Regulations.* Retrieved January 2009, from http://www.arb.ca.govlregactlcarfg3/fsor.pdf

California Energy Commission. (2008). *2007 Net System Power Report, Commission Report,* CEC-200-2008-002-CMF. Retrieved January 2009, from http://www.energy.ca.gov/2008publications/CEC-200-2008-002/CEC-200-2008-002-CMF.PDF

California Energy Commission. 2007 Total Electricity System Power table and California Gross System Power tables for 2002 - 2007.2007 table retrieved January 2009, from http://energyalmanac.ca.gov/electricity/totalsystempower.htmI.Prior year tables are retrieved by following link at bottom of each successive web page.

California Natural Resources Agency. (2008). *California Environmental Quality Act: Public Resources Code section 21000 et seq.* Retrieved January 2009, from http://www.leginfo.ca.gov/cgi-bin/waisgate?WAISdocID=52707418984+1 +O+O&WAISaction=retrieve

California Public Utilities Commission, 2007. Decision 07-09-017: Interim Opinion on Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector. Retrieved January 2009, from http://docs.cpuc.ca.gov/word pdf/FINAL DECISIONI72513.pdf

California State Treasurer. *Pooled Money Investment Account, Government Code Sections 16430-16480.4: Eligible securities for investment* of *surplus moneys.* Retrieved January 2009, from http://www.treasurer.ca.gov/pmia-laif/answer/P statutes.pdf

Murtishaw, Scott, and Karen Griffin, Joint California Public Utilities Commission and California Energy Commission Staff Proposal for an Electricity Retail Provider GHG Reporting Protocol, June 12,2007, downloaded on March 30, 2009 from fip://fip.cpuc.ca.gov/puc/energy/electric/climate+change/Joint+Staff+GHG+Reporting+Proposal.pdf

This Page Intentionally Left Blank

Appendix A

Proposed Regulation for the AB 32 Cost of Implementation Fee and Proposed Amendments to the Mandatory Reporting of Greenhouse Gas Emissions Regulations

This Page Intentionally Left Blank

AS 32 COST OF IMPLEMENTATION FEE

Adopt new article 3, *sections 95200 to 95207, title* 17, *California Code* of *Regulations, to read* as *follows:*

(Note: All of the following is new language to be added to the California Code of Regulations.)

Article 3: Fees for Sources of Greenhouse Gas Emissions

95200. Purpose.

The purpose of this article is to collect fees to be used to carry out the California Global Warming Solutions Act of 2006 (Stats. 2006; Ch. 488; Health and Safety Code sections 38500 *et seq.),* as provided in Health and Safety Code section 38597.

NOTE: Authority cited: Sections 38510, 38597, 39600 and 39601, Health and Safety Code. Reference: Sections 38530 and 39600, Health and Safety Code,

95201. Applicability.

(a) This article applies to the following entities. The terms used below are defined in section 95202.

(1) Natural Gas Utilities, Users, and Pipeline Owners and Operators that distribute or use natural gas in California.

(A) All public utility gas corporations operatin'g in California. Fees shall be paid for each therm of natural gas delivered to any end user in California.

(8) All owners or operators of interstate and intrastate pipelines, not included in subsection (a)(1)(A), that distribute natural gas directly to end users in California. Fees shall be paid for each therm of natural gas directly distributed by interstate or intrastate pipelines.

(C) All California owners or operators that consume natural gas produced on-site and that are subject to Mandatory Reporting Regulation. Fees shall be paid for each therm of natural gas consumed of the natural gas produced on-site.

(D) All California owners or operators that consume associated gas that is produced on-site and that are subject to the

Mandatory Reporting Regulation. Fees shall be paid on the amount of emissions resulting from the combustion of these fuels.

(2) Producers and Importers of Gasoline and Diesel Fuels.

(A) All producers and importers of California gasoline or California diesel for use in California. Fees shall be paid for each gallon of gasoline or diesel fuel distributed.

(8) All producers or importers of CAR808. Fees Shall be paid for each gallon of CAR808 plus the designated amount of oxygenate.

(3) Refineries.

Fees shall be paid on the amount of emissions by the owner or operator of any refinery that emits process emissions resulting from the steam methane reforming process, or the production or consumption of:

(A) Catalyst coke;

(8) Petroleum coke; or

(C) Refinery gas.

(4) Cement Manufacturers.

All entities or operators of cement manufacturing facilities that emit greenhouse gases through the clinker manufacturing process. Fees shall be paid on reported quantities of emissions.

(5) Retail Providers and Marketers of Imported Electricity.

Any retail provider or marketer that is the purchasing/selling entity at the first point of delivery in California of imported electricity. Fees shall be paid for each megawatt-hour of imported electricity.

(6) Facilities that Combust Coal.

Any owner or operator of a facility that combusts coal in California and is subject to the Mandatory Reporting Regulation. Fees shall be paid on the reported emissions.

(b) This article does not apply to any of the following fuels, or to emissions resulting from combustion of any of the following fuels:

(1) aviation gasoline;

(2) jet fuel;

(3) kerosene;

(4) liquefied petroleum gas;

(5) biodiesel;

(6) renewable diesel;

(7) residual fuel oil;

(8) propane; or

(9) any fuel exported for use outside of California.

NOTE: Authority: Sections 38510,38597,39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505 and 39300, Health and Safety Code.

95202. Definitions.

(a) For the purposes of this article, the following definitions shall apply:

(1) "AB 32" means the California Global Warming Solutions Act of 2006, Assembly Bill 32, Chapter 488, Statutes of 2006, as codified at Health and Safety Code section 38500 *et seq.*

(2) "Annual" means with a frequency of once a year; unless otherwise noted, annual events such as the fee payment and liability will be based on the calendar year.

(3) "ARB" or "Board" means the California Air Resources Board.

(4) "Asset-controlling supplier" means any entity that operates electricity generating facilities or serves as an exclusive marketer for certain generating facilities even though it does not own them, and assigned a supplier-specific identification number for its fleet of generating facilities under the provisions of article 2, title17 of the California Code of Regulations.

(5) "Asset-owning supplier" means any entity that owns electricity generating facilities that deliver electricity to a transmission or

distribution line, and is assigned a supplier-specific identification number for its fleet of generating facilities under the provisions of article 2, title 17 of the California Code of Regulations.

(6) "Associated gas" means hydrocarbon-based gaseous fuel produced in association with crude oil from any oil well and subsequently burned in the field as a fuel.

(7) "Biodiesel" means a diesel fuel substitute produced from nonpetroleum renewable resources that meet the registration requirements for fuels and fuel additives established by the Environmental Protection Agency under section 211 of the Clean Air Act. It includes biodiesel meeting all of the following:

(A) Registered as a motor vehicle fuel or fuel additive under title 40, Code of Federal Regulations, part 70;

(B) A mono-alkyl ester;

(C) Meets American Society for Testing and Material designation ASTM D 6751-08 *(Standard Specification for Biodiesel Fuel Blendstock (B100) for Middle Distillate Fuels);*

(D) Intended for use in engines that are designated to run on conventional diesel fuel; and

(E) Derived from nonpetroleum renewable resources.

(8) "Calendar year" means the time period from January 1 through December 31.

(9) "California gasoline" has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

For California gasoline,

(A) "Produce" for California gasoline has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

(B) "Producer" for California gasoline has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

(C) "Supply" for California gasoline has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

(0) "Importer" for California gasoline means the majority owner of the California gasoline when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

(E) "Import" for California gasoline means movement of California gasoline into the state of California. For rail cars, cargo tanks, and pipelines it is when the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

(10) "California reformulated gasoline blendstock for oxygenate blending, or "CARBOB," has the same meaning asdefined in title 13 of the California Code of Regulations, section 2260(a).

For CARBOB,

(A) "Produce" for CARBOB has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

(B) "Producer" for CARBOB has the same meaning as defined in title 13 of the California Code of Regulations, section 2260 (a).

(C) "Supply" for CARBOB has the same meaning as defined in title 13 of the California Code of Regulations, section 2260(a).

(0) "Importer" for CARBOB means the majority owner of the CARBOB when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

(E) "Import" for CARBOB means movement of CARBOB into the state of California. For rail cars, cargo tanks, and pipelines it is when the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

(11) "California diesel fuel" has the. same meaning as "Vehicular Diesel Fuel" as defined in title13 California Code of Regulations, section 2282(b).

For California diesel fuel,

(A) "Produce" for California diesel fuel has the same meaning as "Vehicular Diesel Fuel" as defined in title 13 of the California Code of Regulations, section 2282(b).

(8) "Producer" for California diesel fuel has the same meaning as "Vehicular Diesel Fuel" as defined in title 13 of the California Code of Regulations, section 2282(b).

(C) "Supply" for California diesel fuel has the same meaning as defined in title 13 of the California Code of Regulations, section 2282(b).

(D) "Importer" for California diesel fuel means the majority owner of the California diesel fuel when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

(E) "Import" for California diesel fuel means movement of product into the state of California. For rail cars, cargo tanks, and pipelines it is when the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

(12) '"Carbon dioxide" or "C02" means the most common of the six primary greenhouse gases, consisting on a molecular level of a single carbon atom and two oxygen atoms.

(13) "Carbon dioxide equivalent" or "C02E" or "CO_2equivalent" means a measure for comparing carbon dioxide with other greenhouse gases, based on the quantity of those gases multiplied by the appropriate global warming potential factor and commonly expressed as metric tons of carbon dioxide equivalents ($MTCO_2E$).

(14) '"Catalyst" means a substance added to a chemical reaction, which facilitates or causes the reaction, and is not consumed by the reaction.

(15) "Catalyst coke" means carbon that is deposited on a catalyst, thus deactivating the catalyst.

(16) "Cement" means a building material that is produced by heating mixtures of limestone and other minerals or additives, at high temperatures in a rotary kiln to form clinker, followed by cooling and grinding with blended additives. Finished cement is a powder used with water, sand and gravel to make concrete and mortar.

(17) "Cement manufacturer" means an owner or operator of a cement plant.

(18) "Cement plant" means an industrial structure, installation, plant or building primarily engaged in manufacturing Portland, natural, masonry, pozzolanic, and other hydraulic cements, and typically identified by North American Industry Classification System Code 327310.

(19) "Clinker" means the mass of fused material produced in a cement kiln from which finished cement is manufactured by milling and grinding.

(20) "Coal" means all solid fuels classified as anthracite, bituminous, sub-bituminous, or lignite by the American Society for Testing and Material Designation ASTM 0388-05 "Standard Classification of Coals by Rank."

(21) "Combust" means the process of burning or setting fire to a fuel.

(22) "Combustion emissions" means greenhouse gas emissions occurring during the exothermic reaction of a fuel with oxygen.

(23) "Cracking" means the process of breaking down larger molecules into smaller molecules, utilizing catalysts *andlor* elevated temperatures and pressures.

(24) "Debt" means those loans obtained by the Board and required by the Legislature to be repaid to carry out AB 32 for fiscal years *2007/08, 2008/09,* and any loans necessary for the *2009/10* fiscal year.

(25) "Electricity Fee Rate" means the rate charged per MWh of imported electricity generated at a specified source or an unspecified source based on source-specific emissions factors, or a default emissions factor for unspecified sources.

(26) "Emissions" means the release of greenhouse gases into the atmosphere from sources and processes in a facility.

(27) "Emissions data report" or "greenhouse gas emissions data report" or "report" means the report prepared by an operator each year and submitted by electronic means to ARB to comply with this article.

(28) "Emissions factor" means a unique value for determining an amount of a greenhouse gas emitted for a given quantity of activity (e.g., metric tons of carbon dioxide emitted per gallon of gasoline burned).

(29) "End user" means either:

(A) the point to which natural gas is delivered for consumption, or

(B) a publicly-owned natural gas utility that further distributes natural gas for consumption.

(30) "Entity" means a person, firm, association, organization, partnership, business trust, corporation, limited liability company, company, government agency, or public district.

(31) "Exclusive marketer" means a marketer that has exclusive rights to market electricity for a generating facility or group of generating facilities.

(32) "Executive Officer" means the Executive Officer of ARB or his or her delegate.

(33) "Facility" means any property, plant, building, structure, stationary source, stationary equipment or grouping of stationary equipment or stationary sources located on one or more contiguous or adjacent properties, in actual physical contact or separated solely by a public roadway or other public right-of-way, and under common operational control, that emits or may emit any greenhouse gas. Operators of military installations may classify such installations as more than a single facility based on distinct and independent functional groupings within contiguous military properties.

(34) "Fee determination notice" means the notice provided by ARB to entities regulated by this article stating the dollar amount due for the current calendar year.

(35) "Feedstock" means the raw material supplied to a process.

(36) "Fiscal year" means the time period from July 1 to June 30.

(37) "Fuel" means solid, liquid or gaseous combustible material.

(38) "Fuel fee rate" means the rate charged per $MTCO_2$ produced by greenhouse gas sources specific to the fuel combusted and calculated by ARB.

(39) "Gallon" means the United States gallon of 231 cubic inches or the volumetric gallon adjusted to 60 degrees Fahrenheit when the invoice and settlement is made on the temperature corrected gallonage.

(40) "Generating facility" means an existing or planned location or site at which electricity is or will be produced.

(41) "Generating unit" means any combination of physically connected generator(s), reactor(s), boiler(s), combustion turbine(s), or other prime mover(s) operated together to produce electric power.

(42) "Global warming potential" or "GWP factor" means the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time.

(43) "Government agency" means any agency as defined in Government Code section 11000.

(44) "Greenhouse gas source" means any physical unit, process, or other use or activity that releases a greenhouse gas into the atmosphere.

(45) "Imported electricity" means electricity that is generated outside of California and delivered into California. Imported electricity does not include power wheeled through California, which is power that is imported into California that terminates in a location outside of California.

(46) "Importer" means the majority owner of the California gasoline, CARBOB, or California diesel fuel when it first enters the state of California. For rail cars, cargo tanks, and pipelines it is the point where the product first crosses the California state border. For imports by marine vessel it is the point where the fuel leaves the vessel.

(47) "Interstate Pipeline" means any entity engaged in natural gas transportation subject to the jurisdiction of the Federal Energy Regulatory Comm'ission (FERC) under the Natural Gas Act.

(48) "Kerosene" means a light distillate fuel that includes No. 1-K and No. 2-K as well as other grades of range or stove oil that have properties similar to those of No. 1 fuel oil.

(49) "Mandatory Reporting Regulation" means ARB's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, as set forth in title 17, California Code of Regulations, Chapter 1, Subchapter 10, article 2 (commencing with section 95100).

(50) "Marketer" means a purchasing/selling entity that is not a retail provider, and that is the purchaser/seller at the first point of delivery in California for electric power imported into California, or the last point of receipt in California for power exported from California.

(51) "Megawatt-hour" or "MWh" means the electrical energy unit of measure equal to one million watts of power supplied to, or taken from, an electric circuit steadily for one hour.

(52) "Meter" means a device designed to measure, record or regulate the amount or volume of the flow of a gas.

(53) "Metric ton" or "MT" or "tonne" means a common international measurement for the quantity of greenhouse gas emissions, equivalent to about 2204.6 pounds, or 1.1 short tons.

(54) "Motor vehicle" has the same meaning as defined in section 415 of the Vehicle Code.

(55) "Natural gas" means a naturally occurring mixture of hydrocarbons (e.g., methane, ethane, or propane) produced in geological formations beneath the Earth's surface that maintains a gaseous state at standard atmospheric temperature and pressure under ordinary conditions.

(56) "Natural gas importer" means any entity that receives natural gas from a party that is not a public gas corporation, as defined in this article that consumes and/or distributes natural gas to consumers of natural gas.

(57) "Operational control" for a facility subject to this article means the entity that has authority to introduce and implement operating, environmental, health and safety policies.

(58) "Operator" means the entity having operational control of a facility.

(59) "Owner" means the entity having title of the property or assets which are subject to the fee.

(60) "Payment period" means 60 days from the receipt of the billing, as stated in section 95205 each calendar year.

(61) "Petroleum coke" means a solid residue high in carbon content and low in hydrogen that is the final product of thermal decomposition in the condensation process in cracking.

(62) "Petroleum refinery" or "refinery" means any facility engaged in producing gasoline, aromatics, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt, or other products through distillation of petroleum or through redistillation, cracking, rearrangement or reforming of unfinished petroleum derivatives.

(63) "Power" means electricity, except where the context makes clear that another meaning is intended.

(64) "Process" means the intentional or unintentional reactions between substances or their transformation, including, but not limited to, the chemical or electrolytic reduction of metal ores, the thermal decomposition of substances, and the formation of substances for use as product or feedstock.

(65) "Process emissions" means:

(A) For cement manufacturing: The greenhouse gas process emissions produced through the chemical reactions of feedstock during pyroprocessing to produce cement clinker (which does not include greenhouse gas emissions which are the result of fuel combustion emissions).,

(8) For refineries:

1. the greenhouse gas emissions resulting from the on-site consumption of catalyst coke, and

2. all greenhouse gas emissions both on- and off-site, resulting from the combustion of petroleum coke and refinery gas in California, and

3. the greenhouse gas emissions resulting from the steam methane reforming process excluding those that occur as a result of the use of natural gas as a feedstock.

(66) "Producer" means any person who owns, leases, operates, controls or supervises a California production facility.

(67) "Production facility" means a facility in California at which gasoline or CARBOB is produced. Upon request of a producer, the Executive Officer may designate, as part of the producer's production facility, a physically separate bulk storage facility which (A) is owned or leased by the producer, and (B) is operated by or at the direction of the producer, and (C) is not used to store or distribute gasoline or CARBOB that is not supplied from the production facility.

(68) "Propane" means a normally straight chain hydrocarbon that boils at -3.67 degrees Fahrenheit and is represented by the chemical formula C_3H_8.

(69) "Publicly-owned utility" means a municipality or municipal corporation, a municipal utility district, a public utility district, or a joint powers authority that includes one or more of these agencies that furnishes natural gas services to end users.

(70) "Public utility gas corporation" is a gas corporation defined in California Public Utilities Code section 222 that is also a public utility as defined in California Public Utilities Code section 216.

(71) "Purchasing/selling entity" means an entity that is eligible to purchase or sell energy or capacity and reserve transmission services.

(72) "Renewable diesel" means a motor vehicle or fuel additive which is all of the following:

(A) Registered as a motor vehicle fuel or fuel additive under 40 CFR part 79;

(B) Not a mono-alkyl ester;

(C) Intended for use in engines that are designated to run on conventional diesel fuel; and

(D) Derived from nonpetroleum renewable resources.

(73) "Report Year" means the calendar year for which emissions are being reported in the emissions data report.

(74) "Retail provider" means an entity that provides electricity to retail end users in California and is an electric corporation as defined in Public Utilities Code section 218, electric service provider as defined in Public Utilities Code section 218.3, local publicly owned electric utility as defined in Public Utilities Code section 9604, community choice aggregator as defined in Public Utilities Code section 331.1, or the Western Area Power Administration.

(75) "Source" means greenhouse gas source.

(76) "Specified source" or "specified source of power" means a particular generating unit or facility for which electrical generation can be confidently tracked due to full or partial ownership or due to its identification in a power contract including any California eligible renewable resource, or an asset-owning or asset-controlling supplier.

(77) "Stationary" means neither portable nor self propelled, and operated at a single facility.

(78) "Steam methane reforming process" means a method in which high temperature steam is used to produce hydrogen from a methane source.

(79) "Therm" means a unit of heat equal to 100,000 British thermal units (1.054×10^8 joules).

(80) 'Ton" means a short ton equal to 2000 pounds.

(81) "Unspecified source of power" or "unspecified source" means electricity generation that cannot be matched to a particular generating facility.

NOTE: Authority cited: Section 38510, 38597, 39600 and 39601, Health and Safety Code. Reference: Sections 38530,39600 and 39601, Health and Safety Code.

95203. **Calculation of** Fees.

(a) *Total Required Revenue (TRR).*

(1) The Required Revenue (RR) shall be the total amount of funds necessary to recover the costs of implementation of AB 32 program expenditures for each Fiscal Year, based on the number of personnel positions, including salaries and benefits and all other costs, as approved in the California Budget Act for that fiscal year.

(2) For Fiscal Years 2009/2010,2010/2011,2011/2012,2012/2013, and 2013/2014, the RR shall also include the payments required to be made by ARB on the Debt.

(3) The RR shall also include any amounts required to be expended by ARB in defense of this article in court.

(4) If there is any excess or shortfall in the actual revenue collected for any fiscal year, or if any collections are less than the Revenue Requirement, such shortfall or excess shall be carried over to the next year's calculation of the Total Revenue Requirement. The annual Total Revenue Requirement is equal to the annual RR adjusted for the previous fiscal year's excess or shortfall amount.

(b) *Common Carbon Cost* (CCC).

The Executive Officer shall calculate a Common Carbon Cost (CCC), which represents the cost per $MTCO_2$ emitted. The CCC shall be calculated in accordance with the following formula:

$$CCC = \frac{TRR}{(Q_c \times EF_{c)} + (Q_{ng} \times EF_{ng)} + (Q_g \times EF_{g)} + (Qd \times EF_{d)} + (Qie \times EF_{ie}) + TEl}$$

Where

TRR= Total Required Revenue, as specified in subsection 95203(a).

$(Q_c \times EF_{c)}$ = Statewide total quantity of emissions from coal calculated as the sum of:

(Qb x EFb) = Quantity of bituminous coal (Qb) x emission factor for bituminous coal (EFb);

(Q, x EF,) = Quantity of lignite coal (Ql) x the emission factor (EF,) for lignite coal;

$(Q_a \times EF_{a)}$ = Quantity of anthracite coal (Q_a) x the emission factor $(EF_{a)}$ for anthracite coal;

(Qsb x EF_{sb}) = Quantity of subbituminous coal (Qsb)X the emission factor (EFsb) for subbituminous coal;

Q_{ng} = Statewide quantity in therms of natural gas supplied during the reporting period

EF_{ng} = Emission Factor of $MTC0_2$ for each supplied therm of natural gas

Statewide quantity of gasoline supplied during the reporting period. This is the volumetric sum of California gasoline produced or imported into California and the amount of finished CARBOB product produced or imported into California. The finished CARBOB product is calculated as the volume sum of the CARBOB plus the maximum amount of oxygenate designated for each volume of CARBOB.

Emission Factor of $MTC0_2$ for each supplied gallon of California gasoline. .

Quantity of Califo,rnia diesel fuel supplied during the reporting period

Emission Factor of $MTC0_2$ for each supplied gallon of diesel fuel

$(Qie \times EFje)$ = Total CO_2 emissions from total imported electricity as the sum of:

$(Q_{sp} \times EF_{sp})$ = Quantity of MWh of electricity imported from each specified source x emission factor for that specified source

$(Q_{usp} \times EF_{usp})$ = Statewide quantity of MWh of electricity imported from unspecified sources x emission factor for unspecified source.

TEl = Total state process emissions inventory for cement manufacturers and refineries, and emissions from the combustion of associated gas.

(c) *Fuel Fee Rate.*

For entities reporting pursuant to section 95204(d)(1-3), (e) and (f), the Executive Officer shall calculate a Fuel Fee Rate for each fuel included in subsection 95203(b) using the following formula:

$$FR_i = CCC \times EF_i$$

Where:

FRj = The Fuel Fee Rate for the fuel

CCC = Common Carbon Cost

EFj = Emission Factor of MTC02 for each unit of fuel supplied.

(d) *Fuel Emission Factors.*

For entities reporting pursuant to section 95204(d)(1-3), (e).and (f) the Executive Officer shail calculate the Common Carbon Cost and the Fuel Fee Rates using the following emissions factors:

Fuel Type	C02 Emission Factor	Emission Factor Units
Coal		
Anthracite'	2,597.94	ka CO_2 / short ton
Bituminous	2,328.35	ka C02 / short ton
Sub-bituminous	1,673.64	ka CO_2 / short ton
Lignite	1,369.32.	ka CO_2 / short ton
Natural Gas	5.302	kg CO_2 / therm
Diesel	9.96	ka CO_2 / aallon
Gasoline	8.55	ka CO_2 / aallon

(e) *Imported Electricity Fee Rate.*

The Executive Officer shall calculate an Imported Electricity Fee Rate for each affected entity pursuant to se'ction 95204(f) using the following formulas:

EFR_{sp} = cce x EF_{sp}
EFR_{asp} = CCC x EF_{asp}
EFR_{usp} = CCC x EF_{usp}.

Where:

"sp" denotes a specified source that is a generating facility or unit

"asp" denotes an asset-owning or asset-controlling supplier

"usp" denotes an unspecified source

CCC = Common Carbon Cost

EFR_{sp} = The Electricity Fee Rate for the specified source

EFR_{asp} = The Electricity Fee Rate for the asset-owning and asset-controlling suppliers

EFR_{usp} = The Electricity Fee Rate for unspecified sources

EF_{sp} = Emission Factor for specified source in $MTCO_2$ per MWh

EF_{asp} = Emission Factor for asset-owning and asset-controlling suppliers in MTC02 per MWh

EF_{usp} = 0.499 $MTCO_2$ per MWh, the default Emission Factor for unspecified sources.

(f) *Emissions Factors for Generating Units* or *Facilities* of *Imported Electricity.*

The Executive Officer shall calculate emissions factors for specified sources of imported electricity that are generating units or facilities using the following methodology:

$$EF_{sp} = \frac{E_{sp}}{EG}$$

Where:

EF_{sp} = Emission Factor for specified source liSp", in $MTCO_2$ per MWh

E_{sp} = CO_2 emissions from electricity generation for a specified electric generating facility/unit for the report year ($MTCO_2$)

EG = Net generation from a specified .electric generating facility for the report year (MWh)

(1) For specified electric generating facilities/units whose operators are subject to reporting or who voluntarily report under the Mandatory Reporting Regulation, E_{sp} shall be equal to the sum of C02 emissions directly associated with electricity generation as reported to ARB. Similarly, EG shall be the net generation reported to ARB.

(2) For specified electric generating facilities/units whose operators are not subject to Mandatory Reporting Regulation but who are subject to the Acid Rain Program (40 CFR Part 75), E_{sp} shall be equal to the amount of C02 emissions reported to U.S. EPA pursuant to 40 CFR Part 75 for the facility in metric tons for the report year. EG shall be data reported to EIA and published in the

EIA 923 Excel file for the reporting year available at http://www.eia.doe.gov/cneaf/electricitv/page/eia906920.html(the EIA data).

(3) For specified electric generating facilities whose operators do not report to ARB under the Mandatory Reporting Regulation and do not report to U.S. EPA under the Acid Rain Program, EG shall be taken from the EtA data for the reporting year. Esp shall be . calculated using EIA data as shown below.

$Esp = 1000 \times Y(Qfuel \times EFfuell$

Where:

Qfuel = Heat of combustion for each specified fuel type from the specified electric generating facility for the report year (MMBtu)

EFfuel = CO_2 emission factor for the specified fuel type as taken from the title 17, California Code of Regulations, Chapter1 Subchapter 9, Article 2, Appendix A (kgC02/MMBtu)

(g) *Emission Factors for Asset Owning/Controlling Suppliers.*

The Executive Officer shall calculate emissions factors for asset-owning or asset-controlling suppliers using the following methodology:

$$EF_{asp} = \frac{\sum E_{asp} + \sum(PE_{sp} * EF_{sp}) + (PE_{usp} * EF_{usp}) - \sum(SE_{sp} * EF_{sp})}{\sum EG_{asp} + \sum PE_{sp} + PE_{usp} - \sum SE_{sp}}$$

EF_{asp} = Emission Factor for asset- owning and asset-controlling suppliers in $MTC0_2$ per MWh

$\sum E_{asp}$ = the sum of CO_2 emissions from electricity generation for each specified electric generating facility/unit in the asset owning/controlling supplier's fleet, as reported to ARB under the Mandatory Reporting Regulation ($MTC0_2$)

$\sum EG_{asp}$ = the sum of net generation for each specified electric generating facility/unit in the asset owning/controlling supplier's fleet for the report year as reported to ARB under the Mandatory Reporting Regulation(MWh)

$\sum PE_{sp}$ = Sum of electricity purchased from specified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

PE_{usp} = Amount of electricity purchased from unspecified sources by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

$\sum SE_{sp}$ = Amount of wholesale electricity sold from a specified source by the asset-owning or asset-controlling supplier for the year as reported to ARB under the Mandatory Reporting Regulation (MWh)

EF_{sp} = C02 emission factor as defined for generating units and facilities.

EF_{usp} = CO_2 default emission factor for unspecified sources.

(h) *Fee Liability for Fuels.*

The Executive Officer shall calculate the Fee Liability for each entity reporting pursuant to section 95204(d)(1-3), (e) and (f) based on the quantity of each fuel supplied, consumed or produced, as follows:

FSj = (FRj x QFj)

Where:

FSj = The Fee Liability for each entity
QFj = Quantity of fuel
(Note: The Fee Liability calculation formula for associated gas is addressed under section 95203(j))

(i) *Fee Liability for Imported Electricity.*

The Executive Officer shall calculate the fee liability for each entity reporting pursuant to section 95204(9) based on the quantity of electricity imported, as follows:

FSj = (EFRj x QM_i)

Where:

FSi = The Fee Liability for each entity
QMi = Quantity of MWh of imported electricity from each specified source, asset-owning or asset-controlling supplier, or unspecified source, as appropriate

EFRi = Electricity fee rate for each specified source, asset-owning or asset-controlling supplier, or unspecified source, as appropriate

(j) *Fee Liability for Entities.*

For entities reporting pursuant to section 95204(d)(4), (h) and (i), each entity shall be charged a Fee based on the total number of MTC02 emitted and reported annually. The fee shall be calculated as follows:

$FS_i = CCC \times QE_l$

Where:

FS_j = The Fee for the Entity

CCC = Common Carbon Cost

QE_1 = the total amount of process emissions associated with the entity.

NOTE: Authority cited:' Sections 38510,38597,39600 and 39601, Health and Safety Code. Reference: 38501,38510,38597,39600 and 39601, Health and Safety Code.

95204. Reporting and Recordkeeping Requirements.

(a) *Reporting Format.*

All reports required by this article must be submitted to ARB by using the California Air ResourcesBoard's Greenhouse Gas Reporting Tool, as specified in title17, California Code of Regulations section 95104(e), and is available on ARB's internet website at www.arb.ca.gov.

(b) All entities subject to this article must report the following:

(1) Report Information:
- (A) Report Year
- (B) Facility Information
  - (i) Facility name
  - (ii) Physical address
  - (iii) Mailing address
  - (iv) Description of facility geographic location

(2) Operator Information:
- (A) Operator name
- (B) Email address

(C) Telephone number

(3) Operator Statement of Truth, Accuracy and Completeness", Operator signature and date stating: *This report has been prepared in accordance with subchapter 105, article 1, sections 95100 to* 95133*, title* 17*, California Code of Regulations. The statements and information contained in this emissions data report are true, accurate and complete.*

(c) *Timeline for Reporting.*

(1) Reports for the 2008 calendar year must be submitted to ARB by January 2, 2010, or by the operative date of this article, whichever is later.

(2) Reports for the 2009 and subsequent calendar years must be submitted to ARB by June 30 of each year. For those entities subject to ARB's Mandatory Reporting Regulation, changes made to reported data as a result of the verification process" must be concluded by December 1 of each year. "

(d) *Natural* Gas *Utilities, Users and Pipeline Owners and Operators.*

(1) All public utility gas corporations operating in California must annually report the aggregate quantity of therms of natural gas delivered at the meter to end users.

(2) All owners or operators of interstate and intrastate pipelines that distribute natural gas directly to end users must an"nually report the aggregate quantity of therms of natural gas directly distributed, at the metered to the end users.

(3) All California owners or operators that consume natural gas produced on-site and are subject to the Mandatory Reporting Regulation must report the quantity of therms of natural gas consumed annually of natural gas produced on-site in addition to all information required under the Mandatory Reporting Regulation.

(4) All California owners or operators that consume associated gas produced on-site and that are subject to the Mandatory Reporting Regulation must report all information required by the Mandatory Reporting Regulation, including the quantities of emissions resulting from the combustion of these fuels.

(e) *Producers and Importers of Gasoline and Diesel Fuels.*

All producers and importers of California gasoline, CARBOB or California diesel fuel must report the total "amount of each variety of fuel sold or supplied for use in California. Producers and importers of CARBOB must report each volume of CARBOB and the associated designated volume/volumes of oxygenate.

(f) *Coal Combustion.*

All entities that are subject to the Mandatory Reporting Regulation and combust coal must report the number of tons and the grade of coal combusted for each calendar year.

(g) *Retail Providers and Marketers of Imported Electricity.*

(1) *Retail Providers of Electricity.* This information shall be the same information that is required to be submitted under the Mandatory Reporting Regulation, and include the total quantity of MWh of electricity imported from specified sources and unspecified sources with final point of delivery in California, and shall be reported on the schedule specified in the Mandatory Reporting Regulation.

(2) *Marketers.* All marketers of imported electricity must report all information required under the Mandatory Reporting Regulation, be consistent with section 95111 of the Mandatory Reporting Regulation, and include the total quantity of MWh of electricity imported from specified sources and unspecified sources with final point of delivery in California.

(h) *Refinery Process Emissions.*

Each refinery that produces process emissions must report all information required under the Mandatory Reporting Regulation, including individual quantities of those emissions. Each refinery must report the individual quantities of catalyst coke, petroleum coke, and refinery gas produced annually less the quantities exported out of the state. This information shall be derived from the information reported pursuant to the California Energy Commission's Petroleum Industry Information Reporting Act (PIIRA) codified in Public Resources Code sections 25350 *et seq.,* and the Mandatory Reporting Regulation.

(i) *Cement Manufacturers.*

All cement manufacturers must report all information required under the Mandatory Reporting Regulation, including the total amount of process emissions resulting from their operations, as defined in this article. This information shall be the same information as that required to be submitted under the Mandatory Reporting Regulation.

(j) *Records Retention.*

Entities subject to this article must maintain copies of the information reported pursuant to this article and provide them to an authorized representative of ARB within five business days upon request. Records must be kept at a location within the State of California for five years.

NOTE: Authority cited: Sections 38510, 38597, 39600 and 39601, Health and Safety Code. Reference: 38501,38510,38597,39600 and 39601, Health and Safety Code.

95205. Payment and Collection.

(a) For 2010, the Executive Officer shall provide a written fee determination notice to each affected entity of the amount due by February 1, or 30 days after the operative date of this article, whichever is later.

(b) Beginning in 2011, no later than 30 days after the end of each calendar year, the Executive Officer shall provide a written fee determination notice to each affected entity of the amount due for the current calendar year. The amount of the fee shall be based on the reports submitted pursuant to section 95204 and the fee calculation formulas set forth in section 95203.

(c) *Payment Period.* Each entity that is notified by the Executive Officer that it must remit a specified dollar amount to ARB for the current fiscal year shall transmit that dollar amount to ARB for deposit into the Air Pollution Control Fund within 60 days of receipt of the fee determination notice.

(d) *Late Fees.* The Executive Officer shall assess an additional fee on entities failing to pay the fee within 60 days of receipt of the fee determination notice. The Executive Officer shall set the late fee in an amount sufficient to pay ARB's additional expenses incurred by the entity's untimely payment. The late fee is in addition to any penalty that may be assessed as provided in section 95206.

(e) *Expenditure of Fees.* The fees collected from the entities are to be expended by ARB only for the purposes of recovering the costs of carrying out the provisions of AB 32 and repaying the Debt.

NOTE: Authority: Sections 38510,38597,39600 and 39601, Health and Safety Code. Reference: S.ections 38501, 38505 and 39300, Health and Safety Code.

95206. Enforcement.

(a) *Penalties.* Penalties may be assessed for any violation of this article pursuant to Health and Safety Code section 38580. Each day during any portion of which a violation occurs is a separate offense.

(b) *Injunctions.* Any violation of this article may be enjoined pursuant to Health and Safety Code section 41513.

(c) *Violations.* Each day or portion thereof that any report required by this article remains unsubmitted, is submitted late, or contains incomplete or inaccurate information, shall constitute a single, separate violation of this article. For the purposes of this section, "report" means any information required to be submitted by section 95204.

(d) *Payment Violations.* The failure to pay the full amount of any fee required by this article shall constitute a single, separate violation of this article fqr each day or portion thereof that the fee has not been paid after the date the fee is due.

(e) *Auditing.* The Executive Officer may contract with outside entities, including, but not limited to, the Board of Equalization, to obtain data or services needed to audit the returns provided by fee payers. The Executive .Officer may use fee revenues collected under this article to fund auditing and collection procedures.

(f) *Auth orization to Enforce.* Enforcement of this article may be carried out by authorized representatives of ARB; including authorized representatives of air pollution control or air quality management districts.

NOTE: Authority: Sections 38510, 38597, 39600 and 3.9601, Health and Safety Code. Reference: Sections 38501, 38505, 39300 and 41513, Health and Safety Code.

95207. Severability.

(a) Each part of this article is deemed severable, and, in the event that any part of this article is held to be invalid, the remainder of this article shall continue in full'force and effect.

NOTE: Authority: Sections 38510, 38597, 39600 and 39601, Health and Safety Code. Reference: Sections 38501, 38505 and 39300, Health and Safety Code.

This Page Intentionally Left Blank

Proposed Regulation Order

PROPOSED AMENDMENTS TO THE REGULATION FOR THE MANDATORY REPORTtNG OF GREENHOUSE GAS EMISSIONS

Amend section 95104, title 17, *California Code of Regulations to read as follows:*

(Note: The proposed amendments to the existing regulation are shown in underline to indicate proposed additions)

.95104. Greenhouse Gas Emissions Data Report.

(No modifications are proposed to subsections (a) through (d) of *section 95104.)*

(e) The operator shall submit emisSions data reports! and any revisions to the reports, through the California Air Resources Board's Greenhouse Gas Reporting Tool.

NOTE: Authority cited: Sections 38510, 38530, 39600, 39601, and 41511, Health and Safety Code. Reference: Sections 38530,39600, and 41511, Health and Safety Code.

This Page Intentionally Left Blank

Appendix B

Workshop Notices

This Page Intentionally Left Blank

Workshop Notices

Air Resources Board

Mary D. Nichols, Chainnan
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor

January 9, 2009

TO: All Interested Parties

SUBJECT: Public Workshop on AS 32 Administrative Fee Regulation

The Air Resources Board (ARB) invites you to participate in a public workshop concerning the AS 32 Administrative Fee Regulation.

Health and Safety Code Section 38597 (AB 32, Nunez,' Chapter 488, Statues of 2006), added by the Global Warming Solutions Act of 2006, authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions (GHG) to support the administrative costs of implementing AB 32. ARB recently adopted the Climate Change Scoping Plan which outlines California's framework for reducing GHGs. ARB is initiating a rulemaking for this fee, with the intent of bringing a proposed regulation to the Board for consideration in May 2009.

The public workshop will be held at the following location:

DATE: Tuesday, January 27. 2009
TIME: 1:00 p.m. to 4:0'0 pm
PLACE: Cal/EPA HeadquartefS Building
Coastal Hearing Room, 2nd Floor
1001 I Street
Sacramento, CA 95814

The workshop is intended to provide for stakeholders input into development of a fee structure that will support the administration of programs fa implement in AB 32,

For those unable to attend in person, the workshop will be webcast. On the day of the workshop, the broadcast can be accessed at:
http://www.calepa.ca.gov/broadcast/?BDO=1

You can also submit your questions and comments during the workshop to ccworkshops@arb ca goy ARB recommends that you do not run other programs while viewing the webcasf, as it may interrupt or lower the quality of the signal. The agenda and staff presentation for the workshop will be posted at least flYe days prior to the workshop on ARB's website at: http://www.arb.ca.gov/cc/adminfee/adminfee.htm

If you require special accommodations or language needs, please contact Mary Farr at (916) 445-8290 or mfarr@arb cagoy as soon as possible, but no later than 7-10 business days before the scheduled event/meeting. nvrmD/Speech to Speech users may dial 7-1-1 for the California Relay Service.

If you have questions regarding the workshop or the Administrative Fee Regulation Development, please contact Jeannie Blakeslee at (916) 445-8286 or jblakesl@arb.ca.gov

Sincerely,

lsi

Jon Costantino, Manager
Climate Change Planning Section
Office of Climate Change

S:\SHARED\Admin Fee\2OD9 Regulation Development\Workshops\January 27\January 09 draft workshop notice_1.doc

Linda S. Adams
Secretary for
Environmental Protection

Air Resources Board

Mary D. Nichols, Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

AB 32 Administrative Fee Regulation Workshop
Draft Regulatory Language

The Air Resources Board {ARB} invites you to participate in a public workshop to discuss the draft AS 32 Administrative Fee Regulation language.

Health and Safety Code Section 38597 (AB 32, Nunez, Chapter 488, Statues of 2006), added by the Global Warming Solutions Act of 2006, authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions {GHG) to support the administrative costs of implementing AS 32. ARB is in the process of developing a rulemaking for this fee, with the intent of bringing a proposed regulation to the Board for consideration in May 2009.

This workshop is intended to provide an opportunity for stakeholders' input on the draft regulatory language. The workshop will contain time for questions and detailed discussion after staff presentation.

Where and When is the Meeting?

This meeting will be held at callEPA Headquarters in Sacramento and will also be webcast.

DATE:	Wednesday, February 25, 2009
TIME:	1:00 p.m. to 5:00 pm
PLACE:	GalJEPA Headquarters Building Coastal Hearing Room, 2nd Floor 1001 I Street Sacramento, CA 95814

Meeting Topic Details

The purpose of the workshop is to introduce the draft regulatory language for the Administrative Fee Regulation.

Meeting Materials

Meeting matenals and an agenda will be posted on February 19, 2009 at http://www.arb.ca.gov/cc/adminfee/adminfee/htm. At this website you may also join our electronic mailing list to receive further notices of ARB activities and public meetings related to the implementation of AB 32.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: http://www.arb.ca.gov

Printed on Recycled Paper

Can't Make it to the Meeting?
This meeting wiD be webcast, and viewers can email written comments or questions during the session to ccworkshops@arb.ca.gov. Webcast links are posted at . http://www.calepa.ca.gov/broadcast/?BDO=1. ARB recommends that you do not run other programs while viewing the webcast, as it may interrupt or lower the quality of the signal.

Directions to Cal/EPA
There are many ways to arrive at the Cal/EPA Headquarters Building but we encourage you to take public transportation or drive low emission/high efficiency vehicles whenever possible. Use the following link for directions and information on public transit: http://www.calepa.ca.gov/EPAbldg/location.htm.

Special Accommodations or Language Assistance
If you require special accommodations or language needs, please contact Mary Farr at (916) 445-8290 or mfarr@arb.ca.gov as soon as possible, but no later than 7 business days before the scheduled event/meeting. TTYfTDDJSpeech to Speech users may dial 7-1-1 for the California Relay Service.

We Value Your Input
We welcome and encourage your participation in this important efforl. If you have Questions regarding the workshop or the Administrative Fee Regulation development, please contact Jeannie Blakeslee at (916) 445-8286 or jblakesl@arb.ca.gov.

Sincerely.

Charles M. Shulock
Assistant Executive Officer

Linda S. Adams
Secretary for
Environmental Protection

Air Resources Board

Mary D. Nichols, Chairman
1001 I Street • P.O. Box 2815
. Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

Draft AB 32 Cost of Implementation Fee Regulation

The Air Resources Board (ARB) invites you to participate in the 3rd public workshop to discuss the revised draft of the AB 32 Cost of Implementation Fee Regulation. In addition, ARB staff Will discuss the newly proposed amendments to the mandatory reporting regulation in Title 17, California COde of Regulation, Section 95104.

Health and Safety Code Section 38597 (AB 32) authorizes ARB to adopt by regulation a schedule of fees to be paid by sources of greenhouse gas emissions (GHG) to support the administration costs of implementing AB 32.

Where and When is the Meeting?
The workshop will be held at the following location:

DATE:	Monday, April 20, 2009
TIME:	1:00 p.m. to 5:00 pm
PLACE:	calIEPA Headquarters Building Sierra Hearing Room, 2nd ROOT 10011 Street Sacramento, CA 95814

Meeting Topic Details
The purpose of this workshop is to discuss with stakeholders the current status of the development of the fee regulation; the required revenue for AB 32 implementation; and the *newly* proposed amendments to the mandatory reporting regulation.

Meeting Materials
The materials for this workshop will be posted prior to the workshop at ARB's website http://www.arb.ca.gov/cc/adminfee/meetings/meetings.htm. The materials will include an updated draft of the proposed regUlation, information about the required revenue, and amendments to the mandatory reporting regulation.

At this website you may also join our electronic mailing list to receive further notices of ARB activities and public meetings related to the implementation of AS 32.

Can't Make it to the Meeting?
This meeting Will be webcast, and viewers can email written comments or questions during the session to ccworkshops@arb.ca.gov. Webcast links are posted at http://www.calepa.ca.gov/broadcast/?BDO=1. ARB recommends that you do not run other programs while viewing the webcast, as it may interrupt or lower the quality of the signal.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: http://www.arb.ca.gov

Directions to CallEPA
There are many ways to arrive at the Cal/EPA Headquarters Building but we encourage you to take public transportation or drive low emission/high efficiency vehicles whenever possible. Use the following link for directions and information on public transit: http://www.calepa.ca.gov/EPAbldg/location.htm.

Special Accommodations or Language **Assistance**
If you require special accommodations or language needs, please contact Mary FalT at (916) 445-8290 or mfalT@arb.ca.goyassoonas possible, but no later than 7 business days before the scheduled event/meeting. TTYITODISpeech to Speech users may dial 7-1-1 for the California Relay Service.

We Value Your Input
We welcome and encourage your participation in this important effort If you have questions regarding the workshop or the Administrative Fee Regulation development, please contact Jeannie Blakeslee at (916) 445-8286 or jblakesl@arb.ca.gov.

Sincerely,

Jon Costantino, Manager
Office of Climate Change

This Page Intentionally Left Blank

This Page Intentionally Left Blank

Appendix C

Program Costs

This Page Intentionally left Blank

Program Costs

The purpose of this proposed regulation is to repay loans that were used to fund ARB and the California Environmental Protection Agency's (Cal/EPA) implementation of AB 32 in fiscal years 2007/2008 and 2008/2009 and to create a stable and steady funding source for state agencies to carry out AB 32 in future years. This section describes the loans, as well as how ARB proposes to determine the Required Revenue to carry out AB 32 in fiscal year 2009/2010 and future budget years.

This fee would cover expenditures for implementing AB 32, including:

1. 2007/2008 fiscal year loans for ARB and Gal/EPA
2. 2008/2009 fiscal year loan for ARB and Cal/EPA
3. 2009/2010 fiscal year and future year costs for ARB, Cal/EPA and other California state agencies.

The amount of revenue collected through the fees is the Required Revenue, which is the total amount of funds necessary to recover the costs of implementing the AB 32 program, plus loan repayment. The Required Revenue is based on the number of personnel positions, including salaries and benefits, and other expenses (contracts, equipment, etc.), approved in the California Budget Act for that fiscal year. The Total Required Revenue is the Required Revenue adjusted for excess or under collection from the previous fiscal year.

Loan Repayment for ARB and CalEPA

For the 2007/2008 fiscal year, expenditures for ARB and Cal/EPA to carry out AB 32 were supported by loans. ARB received a loan of approximately $15.2 million from the Motor Vehicle Account (MVA) through legislation. The 2007/2008 Budget provided Cal/EPA a loan of approximately $300,000 from MVA (SB 77, Chapter 171, Statutes of 2007, and SB 78, Chapter 172, Statutes of 2007). ARB also was budgeted approximately $8.5 million from the Air Pollution Control Fund (APCF).

For the 2008/2009 fiscal year, the expenditures for ARB and Cal/EPA were covered through a $32 million loan from the Beverage Container Recycling Fund (BCRF). The loan was approved with repayments spelled out within the Budget Act (AB 1781, Chapter 268, statutes of 2008) with budget bill language as follows:

> *"The transfer made by this item is a loan to the Air Pollution Control Fund and shall be fully repaid from revenues established by the State Air Resources Board pursuant to the California Global Warming Solutions Act of 2006. The loan shall be repaid by the earliest feasible date. At least one-third of the loan shall be repaid on or before June 30, 2011, and the*

full amount shall be repaid on or before June 30, 2013. The loan shall be repaid with interest at the rate earned by the Pooled Money Investment Account at the time of the transfer."

For the 2009/2010 fiscal year, the Budget Act (SBX3 1, Chapter 1, Statutes of 2009) approved a $35 million loan (BCRF) for ARB and Cal/EPA expenditures. Timely implementation of this Fee regulation could eliminate the need for some or all of the loan for the 2009/2010 fiscal year. The budget provisions for this loan are as follows:

The transfer made by this item is a loan to the Air Pollution Control Fund and shall be fully repaid from revenues established by the State Air Resources Board pursuant to the California Global Warming Solutions Act of 2006 (Division 25.5 (commencing with Section 38500) of the Health and Safety Code). The loan shall be repaid by the earliest feasible date. At least one-third of the loan shall be repaid on or before June 30, 2012, and the full amount shall be repaid on or before June 30, 2014. The loan shall be repaid with interest at the rate earned by the Pooled Money Investment Account at the time of the transfer.

Table 1 shows the loans used to carry out AB 32 for the first two fiscal years.

Table 1: Fiscal Year *2007/2008* and *2008/2009* Loans To Carry Out AS 32 .

Fiscal Year	Approximate Program Costs ($ Millions)	
FY 2007/2008	(MVA loan, ARB)	$15.2
	(MVA loan, Cal/EPA)	$0.3
FY *2008/2009*	(BCRF loan)	$32.0
Total		**$47.5**

Loan Repayment Plan

Pursuant to Budget Acts SBX3 1 (Chapter 1, Statutes of 2009) and AB 1781 (Chapter 268, Statutes of 2008), the BCRF loans must be fully repaid with interest with at least one-third paid back by the second year. ARB used the same methodology to determine the repayment schedule for the MVA loan, which did not come with legislative directives. Based on the interest rate for each loan, ARB calculated the amount due, including the accrued interest. The interest rate is determined by the rate of the Pooled Money Investment Account at the time the loans are transferred. Table 2 shows the repayment schedule for the two loans. As shown in the table, ARB will repay the loans over four years. If ARB requires funds from the *2009/2010* loan, this repayment schedule will be modified to incorporate repayment of that loan.

Table 2: Repayment Schedule for
Fiscal Year *2007/2008* and *2008/2009* Loans

Payment Due Date	Approximate Amount Due Including Interest ($ million)*
June 30, 2010	$13.7
June 30, 2011	$14.0
June 30, 2012	$13.8
June 30, 2013	$13.2
Total	$54.6

*Numbers do not add due to rounding

ARB Expenses for Fiscal Years *2007/2008* and *2008/2009*

In order to confirm that the funds loaned to ARB were expended on AB 32 related activities for fiscal years *2007/2008* and *2008/2009"* staff reviewed the person years and other expenditures related to AB 32 in each fiscal year. This included the program staff workload associated with AB 32 work products, such as the Scoping Plan, various Early Action Measures, and additional regulatory measu'res. ARB utilized existing program staff, management oversight and program support staff, as needed, in order to complete the considerable workload within the statutory timeline.

Staff related costs include salary, benefits and operating expenses such as facility costs, training and travel. Program support costs account for executive oversight as well as administrative and computer support. To calculate this cost, ARB determined that approximately 13 percent of our program-related positions are budgeted as climate change positions. Staff then attributed 13 percent of the total cost of the Chairman's Office, the Executive Office, administrative services and computer services to the climate change program.

Based on our initial evaluation of fiscal year *2007/2008* expenses, ARB expended resources in excess of the loan amount. Fiscal year *2008/2009* is still in progress, so the expenditures are preliminary, but similarly they show that ARB has expended resources in excess of the loan amount. With the proposed Fee regulation, ARB is proposing that only loan-related budgeted costs shown in Table 2 be recouped for prior fiscal years.

A summary of ARB's AB 32 expenditures for fiscal years *2007/2008* and' *2008/2009* is provided in Tables 3 and 4 below. Tables 3a and 4a provide a more detailed breakdown of ARB's expenditures for the first two years of the AB 32 program.

Table 3: Estimated ARB Expenditures for the AB 32 Program Fiscal Year *2007/2008*

	Costs (Million $)*
Staff Related Costs	
• Salary	$10.75
• Benefits	$3.77
• Operating Costs	$4.21
Program Support[1]	$2.00
Contracts[2]	$4.65
Equipment	$0.05
Total	$25.43

[1] Program Oversight includes Chairman's Office, Executive Office, administrative services and computer support expenses in proportion to the staffing for the AS 32 program.

2Estimated expenditures in the 2007/2008 fiscal year.

*Numbers do not add due to rounding.

Table 3a: Estimated ARB Expenditures for the AB 32 Program Fiscal Year *2007/2008* Detail

Personal Services and Operating Expenses:

Salaries for Program Staff

Classification	Number of PYs	Annual Salaries
Air Pollution Spec	53.74	4,050,831.42
Air Resources Engr	19.70	1,577,282.27
Air Resources Supvr I	19.50	2,003,209.18
Air Resources Supvr II	7.47	857,309.28
Assoc Govtl Prog Analyst	1.60	91,066.20
Assoc Info Systems Analyst-Spec	0.03	1,945.08
Asst Div Chief	1.40	173,653.20
Auto Emission Test Spec II	0.30	13,062.60
Auto Emission Test Spec III	0.66	35,133.75
C.E.A. I	2.95	382,841.40
Environmental Program Manager I	0.25	22,725.00
Exec Asst	1.13	41,398.08
Instrument Techn	0.20	11,966.40
Library Tech Asst I	0.02	646.85
Office Techn-Typing	1.42	52,607.04
Special Consultant	0.16	8,100.48
Staff Air Pollution Spec	14.62	1,349,022.00
Staff Services Analyst-Gen	1.56	64,107.62
Staff Services Mgr I	0.20	13,159.20
Supervisinq Librarian II	0.05	3,839.40
Sub-Total	126.96	10,753,906.44

Benefits		
FICA	6.20%	666,742.20
Medicare	1.45%	155,931.64
Retirement	16.63%	1,788,374.64
Health	10.82%	1,163,572.68
Sub-Total	35.10%	3,774,621.16
	Total Personal Services:	**14,528,527.61**

Operating Costs	Standard Avg Per Position Cost	
General Expense	14,378	1,825,430.88
Printing	766	97,251.36
Communications	2,533	321,589.68
Postage	600	76,176.00
Training	2,500	317,400.00
Travel-In-State	2,395	304,069.20
Facilities	10,000	1,269,600.00
Sub-Total	33,172	4,211,517.12

	Total Program Staff Related Costs:	18,740,044.73
Other Costs		
Contracts		4,652,429.00
Equipment		45,180.00
Program Support		1,998,871.68
Sub-Total		6,696,480.68
	Total Costs:	25,436,525.41

Table 4: Estimated ARB Expenditures for the AB 32 Program
Fiscal Year *2008/2009* - Preliminary

	Costs (Million $)
Staff Related Costs	
• Salary	$16.10
• Benefits	$5.64
• Operating Cost.	$7.54
Program Support[1]	$1.96
Contracts[2]	$5.92
Equipment	$1.83
Total	$38.99

[1]Program Oversight Includes Chairman's Office, Executive Office, administrative service's and computer support expenses in proportion to the staffing for the AS 32 program.
2Preliminary estimate of expenditures in the *2008/2009* fiscal year.

Table 4a: Detailed ARB Expenditures for the AB 32 Program
Fiscal Year *2008/2009* - Preliminary

Personal Services and Operating Expenses:
Salaries for Program Staff

Classification	Number of PYs	Actual Annual Salaries
Air Pollution Spec	85.05	6,959,829.69
Air Resources Engr	32.78	2,786,431.25
Air Resources Field Rep II	1.36	80,325.00
Air Resources Field Rep III	0.15	9,603.00
Air Resources Supvr I	26.00	2,686,079.95
Air Resources Supvr II	9.07	1,055,123.28
Assoc Govtl Prog Analyst	0.68	39,898.92
Assoc Info Systems Analyst-Spec	0.03	2,042.28
Asst Div Chief	1.35	160,402.19
Auto Emission Test Spec II	0.25	11,218.20
Auto Emission Test Spec III	0.00	0.00
C.E.A.I	1.97	255,819.84

Environmental Program Manager I	0.00	0.00
Exec Asst	0.95	39,182.40
Instrument Techn	0.20	11,966.40
Library Tech Asst I	0.02	646.85
Office Asst-Gen	0.70	18,557.28
Office Techn-Typing	2.20	77,635.20
Special Consultant	0.20	10,125.60
Staff Air Pollution Spec	17.76	1,798,343.54
Staff Services Analyst-Gen	1.81	78,612.58
Staff Services Mgr I	0.20	13,816.80
Supervising Librarian II	0.05	3,839.40
Sub-Total	182.77	16,099,499.64
Benefits		
FICA	6.20%	998,168.98
Medicare	1.45%	233,442.74
Retirement	16.57%	2,667,687.09
Health	10.82%	1,741,965.86
Sub-Total	35.04%	5,641,264.68
	Total Personal Services:	21,740,764.32
Operating Costs	**Per Position Cost**	
General Expense	20,454	3,738,377.58
Printing	958	175,093.66
Communications	1,958	357,863.66
Postage	1,000	182,770.00
Training	2,000	365,540.00
Travel-In-State	2,874	525,280.98
Facilities	12,000	2,193,240.00
Sub-Total	41,244	7,538,165.88
	Total Program Staff Related Costs:	29,278,930.20
Other Costs		
Contract		5,917,120.00
Equipment		1,830,564.00
Program Support		1,961,068.98
Sub-Total		9,691,632.98
	Total Costs:	38,987,683.18

Cal/EPA Expenses for Fiscal Years 2007/2008 and 2008/2009

Gal/EPA and ARB undertook a similar process to confirm that the Gal/EPA loans were expended on AB 32 related activities for fiscal years 2007/2008 and 2008/2009, reviewing the person years and other expenditures related to AB 32. Based on an initial evaluation of fiscal year 2007/2008 expenses, Gal/EPA expended resources in excess of the loan amount. Fiscal year 2008/2009 is still in progress, so the expenditures are preliminary estimates. However, combined

with ARB's preliminary *2008/2009* expenditures, they show that the two agencies have expended resources in excess of the loan amount. .

Like ARB, only funds loaned to CaVEPA will be recouped by the fee for fiscal years *2007/2008* and *2008/2009.* A summary of the expenditures is provided in Tables 5 and 6 below.

Table 5: Estimated Cal/EPA Expenditures for the AB 32 Program
Fiscal Year *200712008*

	Costs' (Million $)
Staff Related Costs	
• Salary	$0.15
• Benefits	$0.08
• Operating Cost	$0.12
Contracts	0
Equipment	0
Total	$0.34

[1] Does not add due to roundmg.

Table 6: Estimated Cal/EPA Expenditures for the AB 32 Program
Fiscal Year *2008/2009*· Preliminary

	Costs (Million $)
Staff Related Costs	
• Salary	$0.34
• Benefits	$0.15
• Operating Cost	$0.30
Contracts	0
Equipment	0
Total	$0.79

ARB's AB 32 Activities

In fiscal years *2007/2008* and *2008/2009,* ARB engaged in, and is continuing to engage in, numerous activities to implement AB 32. The statute describes an aggressive timeline for ARB to inventory greenhouse gas emissions in the state, to identify a 2020 emissions goal, to identify and adopt Discrete Early Action Measures to reduce greenhouse gas emissions, to adopt a comprehensive Scoping Plan that describes how the state will meet the goal, and to develop, adopt and implement additional greenhouse gas reduction measures to meet the

2020 goal. The major milestones of AB 32 and their dues dates, most of which are during fiscal years *2007/2008* and *2008/2009,* are shown in Table 7.

Table 7: Major Milestones in AS 32

Status	Milestone
X	Publish a list of Discrete Early Actions (HSC §38550 (a»
X	Determine 1990 greenhouse gas emission level and set 2020 emissions target at that level (HSC §38550)
X	Adopt regulations to require reporting and verification of statewide greenhouse gas emissions (HSC §38530)
X	Approve a Scoping Plan (HSC §38561)
In Process	Adopt regulations to implement Discrete Early Action Measures to be enforceable no later than January 1, 2010 (HSC §38550 (b) and (d»
In Process	Adopt greenhouse gas emission limits and emission reduction measures to become operative January 1, 2012 (HSC §38562)

In order to support these activities, to meet other requirements of AB 32, and to lay the groundwork for meeting the long-term goal described in AB 32. ARB deployed numerous resources. Many of the activities described below will continue in fiscal year *2009/2010,* or will require resources to transition from regulatory development and adoption to regulatory implementation.

A more detailed discussion of ARB's climate change activities in fiscal years *2007/2008* and *2008/2009,* as well as anticipated activities for fiscal year *2009/2010,* follows.

1. Greenhouse Gas Emission Inventory **And Reporting**

AB 32 describes specific tasks and milestones for developing a statewide greenhouse gas inventory.

A. Create Comprehensive Greenhouse Gas Inventory and Establish 2020 Limit

Section 38550 of the Health and Safety Code requires ARB to determine what the statewide greenhouse gas emissions level was in 1990, and approve, in a public hearing, a statewide greenhouse gas emissions limit that is equivalent to that level and which must be achieved by 2020.

Prior to the 2006 statute, ARB did not systematically collect greenhouse gas emissions data or have explicit authority or staff dedicated to collecting and storing greenhouse gas data and forecasting future emissions. Developing a California greenhouse gas emission inventory required establishing an

organizational unit to identify major sources and sinks of greenhouse gas emissions, develop methodologies for estimating greenhouse gas emissions, and identify sources of emissions information necessary to regularly update the statewide greenhouse gas emissions level. Based on the emissions data sources, ARB created a baseline for evaluating the success of emission reduction measures.

In the *2007/2008* fiscal year, staff undertook a comprehensive review of 1990 greenhouse gas emissions estimates using the best available scientific, technical, and economic information. ARB staff gathered data from state and federal agencies, international organizations, and California industries to estimate the total statewide 1990 greenhouse gas emissions level. These emissions estimates were developed through an extensive public process, which included technical workshops. ARB staff estimated the statewide 1990 emissions level to be 427 million metric tons of carbon dioxide equivalent ($MMTC0_2E$). In December 2007, the Board determined the 1990 emissions level to be 427 $MMTC0_2E$ and approved this level as the statewide 2020 greenhouse gas emissions limit.

Work in this area continued in fiscal year *2008/2009* and will continue in fiscal year *2009/2010.* Staff continue to refine the greenhouse inventory, and have developed a web-based interactive tool to identify all methods and data sources used to determine the greenhouse gas emissions in the California's greenhouse gas inventory by economic sector or activity. Inventory staff are also working closely with rulemaking staff to support development and adoption of the Scoping Plan measures.

B. Develop, Implement and Enforce Mandatory Reporting Regulation

Section 38530 of the Health and Safety Code requires ARB to adopt regulations, by January 1, 2008, to require the reporting and verification of statewide greenhouse gas emissions and to monitor and enforce compliance with the reporting program. In order to identify ways to reduce emissions, it was necessary to establish an effective program to collect data from specific greenhouse gas emissions sources, verifying the emissions, monitoring and annual reporting emissions, accounting for emissions from all electricity consumed in the state, including transmission and distribution line losses from electricity generated within the state or imported from outside the state.

In 2007, staff developed a regulation for the mandatory reporting and verification of greenhouse gas emissions from specified sources. In developing the regulation, staff focused on facilities within economic sectors accounting for the largest sources of greenhouse gas emissions. The Board adopted the regulation in December 2007. The mandatory reporting regulation is codified in subchapter 10, article 2, sections 95100 to 95133, title 17, California Code of Regulations.

Greenhouse gas emissions reporting begins in 2009 (for 2008 calendar year emissions.) In fiscal year *2008/2009,* staff provided 'outreach to assist in the implementation of greenhouse gas mandatory emissions reporting. Staff has developed a comprehensive web-based greenhouse gas reporting tool to simplify and guide the reporting process. Staff conducted a series of training 'sessions to familiarize users with the reporting regulation and the Reporting Tool. Staff also developed a series of Reporting Tool user guides for the six economic sectors required to report greenhouse gas emissions. Staff will continue to implement the Mandatory Reporting Regulation in fiscal year *2009/2010.*

Verifier Accreditation Program: The reporting regulation requires facilities to verify their greenhouse gas emissions estimates through a review by ARB-accredited third-party verifiers, consistent with international standards. Verification of emissions reports is required for all facilities subject to mandatory reporting beginning in 2010 (for their 2009 reported emissions). Verification is optional in 2009. In order to ensure an adequate number of third-party verifiers, ARB developed a greenhouse gas verifier training program that will provide accreditation for individuals interested in providing services for verification of greenhouse gas emission data reports. ARB staff also developed an accreditation application process and is presently screening.

In addition to verifier training and accreditation, ARB staff is responsible for determining the potential conflict of interest for proposed verifiers and overseeing verifier performance during emissions report reviews. Verification is also required to validate the emiSSion reduction credits used to meet the requirements of greenhouse gas reduction regulations. This work will also continue in fiscal year *2009/2010.*

2. AS 32 Program Planning

AB 32 identifies ARB as the state agency charged with monitoring and regulating sources of greenhouse gases that cause global warming in order to reduce their emissions. The addition of this new responsibility required ARB to create a new unit charged with overseeing the implementation of AB 32, including development of the Scoping Plan, coordinating ARB's internal climate change efforts, serving as a liaison with other state, local, national, and international agencies, and developing strategies for meeting California's goal of reducing greenhouse gas emissions.

Under AB 32, ARB must prepare and approve a Scoping Plan on or before January 1, 2009, outlining the State's strategy to reduce greenhouse gas emissions to 1990 levels by 2020. In 2007 and 2008, ARB engaged in an intensive effort to develop the Scoping Plan, approved at the December 11,2008 Board meeting, which identifies the actions that will be taken to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions. In developing the Scoping Plan, ARB staff had to develop expertise on emission reduction strategies for greenhouse gases and identify

direct emission reduction measures for potential implementation. Additionally, staff evaluated and recommended alternative compliance mechanisms, market-based compliance mechanisms; and potential monetary and non-monetary incentives.

As required by AB 32, staff also evaluated and considered all relevant information pertaining to the greenhouse gas emission reduction programs in other state, regions, and nations, and evaluated the total potential costs and economic and non-economic benefits of the Scoping Plan, including the impacts on small businesses. Staff additionally identified opportunities for emission reductions from voluntary actions, and conducted public workshops throughout the statewith a portion being held in regions with the most significant'exposure to air pollutants, including communities with minority and low income populations.

To ensure that the public and stakeholders were involved at every stage of the development and implementation of the Scoping Plan, including informal and formal rulemaking activities, staff worked with the Environmental Justice Advisory Committee, the Economic and Technology Advancement Advisory Committee, small businesses, labor unions, community and neighborhood organizations, local chambers of commerce, and faith-based communities.

The Scoping Plan lays out a number of measures that ARB has already adopted or is in the process of developing. Most of the Discrete Early Action Measures in the Scoping Plan have been adopted, and ARB is now working on additional emission reduction measures. Several of these measures are discussed below.

3. Greenhouse Gas Emission Reduction Measures

A. Develop and Implement Discrete Early Action Reduction Measures

Health and Safety Code section 38560.5(a) requires ARB to develop and publish a list of Discrete Early Action greenhouse gas emission reduction measures by June 30,2007. Health and Safety Code section 38560.5(b) further requires ARB to adopt regulations to implement the measures identified on that list, and for those measures to be enforceable by January 1,2010.

In June 2007, the Board approved an initial list of Discrete Early Action Measures, and in October 2007, the Board augmented that list. The nine Discrete Early Action measures and their status are described below:

Diesel Auxiliary Engines on Ocean-Going Vessels Regulation: This regulation will reduce emissions from diesel auxiliary engines on container ships, passenger ships, and refrigerated-cargo ships while berthing at a California port. The regulation provides vessel fleet operators visiting these ports to reduce at-berth emissions from auxiliary engines by connecting to another source of power, most likely grid-based shore power; or using alternative control technique(s) that

achieve equivalent emission reductions. The Board approved this regulation in December 2007.

Reduction Of High Global Warming Potential (GWP) Greenhouse Gases In Consumer Products: At the June 2008 Board hearing, ARB approved amendments to the California Consumer Products Regulation that included the first GWP standard for consumer products in California, the GWP limit for Pressurized Gas Duster products.

Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Measure: This regulation will reduce greenhouse gas emissions produced by heavy-duty tractors by making them more fuel efficient. Fuel efficiency will be improved by requiring the use of aerodynamic tractors and trailers that are also equipped with low rolling resistance tires. The tractors and trailers subject to this regulation must either use United States Environmental Protection Agency Smartway (SmartWay) certified tractors and trailers, or retrofit their existing fleetwith Smartway verified technologies. This regulation was approved in December 2008.

Regulation to Reduce Refrigerant Losses from Servicing of Motor Vehicle Air Conditioning: This regulation will reduce refrigerant emissions from servicing of automotive refrigerants by the do-it-yourselfer. The current automotive refrigerant (R-134a) is a potent greenhouse gas. This regulation will help prevent unnecessary releases of the refrigerant to the atmosphere and applies to automotive refrigerants with a GWP value greater than 150. The Board approved this regulation in January 2009.

Regulation to Reduce Greenhouse Gas Emissions from Semiconductor Operations: This regulation will reduce fluorinated gas emissions from the semiconductor industry. The Board approved this regulation in February 2009.

SFs Reductions from Non-Electric and Non-Semiconductor Applications: This regulation will reduce SFsemissions from uses such magnesium die-casting, fume vent hood testing, tracer gas use, and other niche uses. The Board approved this regulation in February 2009.

Regulation to Reduce Greenhouse Gas Emissions from Vehicles Operating with Underinflated Tires: This regulation will reduce greenhouse gas emissions from vehicles through properly inflated tires. The Board approved the regulation in March 2009.

The Low Carbon Fuel Standard (LCFS): The Low Carbon Fuel Standard (LCFS) reduces the carbon intensity of California's transportation fuels by at least 10 percent by 2020. The LCFS regulation is also designed to reduce California's dependence on petroleum, create a lasting market for clean transportation technology, and stimulate the production and use of alternative low-carbon and no-carbon fuels in California. The Board adopted the LCFS regulation in April 2009.

For the *2008/2009* fiscal year, ARB received additional resources to assist in the development and implementation of the LCFS. These resources are being used to establish and implement the LCFS program, to evaluate sustainability issues, to evaluate the impact of changes to California's fleet of vehicles, and to perform exhaust and evaporative tests of low carbon fuels.

Landfill Methane Capture: ARB staff, in collaboration with the California Integrated Waste Management Board staff, is developing a control measure to provide enhanced control of methane emissions from municipal solid waste (MSW) landfills. The control measure will reduce methane emissions from MSW landfills by requiring gas collection and control systems on landfills where these systems are not currently required and will establish statewide performance standards to maximize methane capture efficiencies. This regulation will be considered at the Board Meeting in June 2009.

B. Develop and Implement Additional Source-Specific Measures

AB 32 tasks ARB with developing and adopting, by January 1,2011, all greenhouse gas emission limits and emission reduction measures necessary to achieve the maximum technologically feasible and cost-effective reductions; Staff have developed or are now developing a number of individual greenhouse gas emissions reduction measures affecting a wide range of sectors. For measures that have already been adopted, resources have transitioned to implementation of the programs. In addition, ARB is working with other members of the Western Climate Initiative to identify source-specific measures that would be appropriate to pursue regionally. Several source-specific measures are discussed below.

The Scoping Plan called on ARB to develop outreach, assistance and education programs that involve small businesses, local governments, communities, green technology, and economic and workforce development to help move California to a low carbon future. ARB has, and will continue to develop, programs to encourage the voluntary implementation of cost effective greenhouse gas emission reduction practices for individuals, small businesses, local and regional governments. ARB is also participating in the Green Collar Jobs Council which is coordinating California's economic development and job training efforts in the green jobs arena.

Reflective Glazing: The purpose of this strategy is to reduce the solar heat gain in a vehicle parked in the sun. A cooler interior would make drivers less likely to activate the air conditioner, which increases carbon dioxide emissions. At this time, ARB is focusing on solar reflective window glazing. The regulation will be considered at the Board Meeting in June 2009.

Medium and Heavy-Duty Hybridization: Hybrid-electric technology offers the potential to significantly reduce emissions and improve fuel efficiency, especially for medium- and heavy-duty trucks operating in urban environments. ARB will consider a regulation and/orincentive program that reduces greenhouse gas emissions of new medium- and heavy-duty trucks sold in California.

Low Friction Engine Oil: Engine oils can be formulated to reduce friction, thereby improving the overall efficiency of the vehicle.

Pavley II: In the Scoping Plan, ARB committed to strengthen vehicle greenhouse emission standards beginning with the 2017 model year. This measure is referred to as Pavley II. The new standards will build on the existing standards (Pavley I) that reach their maximum stringency in 2016.

Energy Efficiency and Co-Benefits Audits: This proposed regulation would require large facilities to conduct an energy efficiency audit of individual combustion and other direct sources of greenhouse gases to determine the potential for efficiency improvements that would result in greenhouse gas emission reductions, and possibly co-benefits from reduction of criteria pollutants and toxic air contaminant emissions. The regulation will be considered at the Board Meeting in October 2009.

Removal of Methane Exemption from Existing Refinery Regulations: Under this measure, existing fugitive methane exemptions would be removed from the regulations applicable to equipment and sources employed in California's refineries.

Refinery Flares: While flare systems protect the refinery and surrounding community from potential catastrophic overpressure in the process units, the combustion of gases in flares results in emissions of various greenhouse gases as well as other air pollutants. Staff will work with local air districts to develop a measure to improve the overall flare gas recovery in the flare systems of refineries.

Oil and Gas Extraction: This measure is intended to reduce fugitive emissions from oil and gas extraction processes. These emissions, mostly in the form of methane, are from well and process equipment venting and from separation and storage units. This measure is scheduled to be adopted in late 2009 or early 2010. Currently, staff is conducting studies to investigate greenhouse gas emissions from this sector to develop accurate greenhouse gas emission estimates.

Oil and Gas Transmission: This measure is intended to reduce greenhouse from the transmission and distribution of natural gas. Transmission-related emissions come primarily from fugitive sources and secondarily from combustion sources. This measure is scheduled to be adopted in 2010 or early 2010. Currently, staff

is conducting studies to investigate greenhouse gas emissions from this sector to develop accurate green,house gas emission estimates.

High GWP Gases: While CO_2 is the most widely recognized greenhouse gas of the Kyoto Protocol of gaseous contributors to the greenhouse effect, there are a number of other pollutants that also contribute to global warming. Kyoto gases, including SFs, HFCs and PFCs, have global warming impact that is hundreds to thousands of times the climate impact of C02 and are therefore called High Global Warming Potential (GWP) gases. To mitigate the high-GWp gases from various sources, staff developed or are in the process of developing several measures, include:

- Regulation to Reduce High-Global Warming Potential Refrigerant Emissions from Stationary Refrigeration and Air Conditioning *(R/AC)* Equipment: This measure is scheduled to be considered by the Board in 2009.

- Specifications for Commercial and Industrial Refrigeration: This regulatory measure proposes new specifications for commercial and industrial refrigeration systems to both reduce emissions of high GWP "refrigerant and to increase energy efficiency of the units.

- Foam Recovery and Destruction Program: This measure is scheduled to go to the Board in December 2010.

- Residential Refrigeration Program: This proposed program would address the over one million residential refrigerators, freezers, and air conditioners that are disposed of each year. This program could also include establishing a voluntary program to encourage the upgrade of pre-2000 residential refrigeration equipment.

- High GWP Reductions from Mobile Sources: The measure could take a variety of forms to reduce GWP emissions from mobile sources such as requiring low GWP refrigerants for new Motor Vehicle Air Conditioning (MVAC) systems, including AIC systems used for heavy-duty and off-road vehicle applications and in the refrigerated shipping container industry. Other strategies could include mitigation of refrigerant emissions at a vehicle's end of life.

- Reduction of High GWP Greenhouse Gases in Consumer Products: Staff is currently working on proposed amendments to the Consumer Product Regulation.

- Sulfur Hexafluoride (SF_S) Emission Reductions for the Electricity Sector and Particle Accelerators: SF_S is a very potent greenhouse gas, with a

GWP approximately 23,000 times more powerful than CO_2. This measure is scheduled to be heard by the Board in December 2009.

- High GWP Gases Fee: ARB is proposing a regulation to reduce high GWP gases through a mitigation fee on the sale of the gases. This mitigation fee would serve to decrease greenhouse gas emissions by changing behavior by increasing price (e.g. improve leakage reduction efforts); inducing new lower GWP alternative products; or providing revenue that can be used to mitigate greenhouse gas emissions elsewhere within the sector.

Greenhouse Gas Emission Reductions from Land Use: In a collaborative effort with other state agencies, local and regional governments, and public stakeholders, ARB staff is developing approaches for addressing greenhouse gas emissions from the land use and transportation sectors. These approaches focus on strategies that incentivize changes in both land use allocations and the amount of passenger vehicle travel within the major metropolitan regions of the state. A key component of this effort is the development of regional greenhouse gas emission reduction targets that-could be met using a wide variety of land use and transportation strategies, including but not limited to: higher density development, increased transit opportunities, and pricing mechanisms. Reducing greenhouse gas emission from land use and transportation is a long-term endeavor. ARB anticipates on-going involvement in the development, tracking, and updating of any targets set for these sectors.

Voluntary Emissions Reduction Protocols: Health and Safety Code Section 38571 requires ARB to adopt methodologies to quantify voluntary greenhouse gas emission reductions and to adopt regulations to verify and enforce any voluntary emission reductions. Staff are working in collaboration with other-agencies and organizations, including the California Climate Action Registry, to develop and adoptgreenhouse gas protocols to support AB 32 program. Protocols for Local Government Operations, Manure Management Digesters and Urban Forests were adopted by the Board in Fall 2008.

C. Evaluate and Develop Market-Based Compliance System

Health and Safety Code section 38570(a) authorizes ARB to include in its regulations the use of market-based compliance mechanisms. AB 32 requires that prior to the inclusion of any market-based compliance mechanism in the regulations, ARB must consider the potential for direct, indirect, and cumulative emission impacts from these mechanisms, including localized impacts in communities already adversely impacted by air pollution. In addition, ARB must design a market-based compliance mechanism that prevents any increase in the emissions of toxic air contaminants or criteria air pollutants; and maximize additional environmental and economic benefits for California.

ARB's Scoping Plan identifies a cap-and-trade regulation as one of the main strategies California will employ to reduce greenhouse gas emissions that contribute to climate change. This program will help put California on the path to meet its 2020 emission reduction goal, and ultimately achieving the more aggressive 2050 goal. Under a cap-and-trade regulation, an overall limit on greenhouse gas emissions from capped sectors will be established under the program, and facilities subject to the cap will be able to trade permits (allowances) to emit greenhouse gases.

To develop the cap-and-trade measure for the Scoping Plan that was adopted in December 2008 and to develop the cap-and-trade regulation for Board consideration in late 2010, staff have, and will continue to, engage in a number of activities including an extensive public outreach process. Staff have held numerous workshops to engage stakeholders in the development of a regulatory concept.

Staff are continuing to work with stakeholders to design a regional cap-and-trade program that is enforceable and meets the requirements otAB 32, including the need to' consider any potential impacts on disproportionately impacted communities. Staff are also working closely with six other western states and four Canadian provinces through the Western Climate Initiative (WCI) to design a regional cap-and-trade program that can deliver greenhouse gas emission reductions within the region at costs lower than could be realized through a California-only program. To that end, ARB rule development schedule is being coordinated with the WCI timeline for development of a regional program.

4. Applied Studies·and Scientific Analysis

AB 32 requires ARB to design cost-effective greenhouse gas emission reduction measures to meet a statewide limit. A diverse portfolio of applied studies is required to help ARB identify and implement the most cost-effective, technologically feasible mitigation strategies. Research to support the requirements of AB 32 also illuminates 'linkages between greenhouse gas emissions and air pollution, as well as the health and social impacts of global warming. This research adds to the considerable, existing research on impacts to California, providing information to facilitate identification and prioritization of mitigation strategies that will not adversely impact regional or community exposures to air pollution.

The research also involves data gathering and ambient monitoring of greenhouse gases or other pollutants of relevance as well as the investigation of fundamental science on global warming, its impacts and associated atmospheric processes to facilitate the adoption of the most cost-effective mitigation strategies. ARB has engaged in intensive seasonal monitoring of ambient levels of greenhouse gases, and has incorporated greenhouse gas monitoring into the existing Toxics Network. ARB is working to coordinate a statewide methane monitoring network, and will begin mobile measurements of greenhouse gases in summer 2009.

ARB has also collaborated with NASA to collect aircraft measurements of greenhouse gas levels in urban, rural, and off-shore areas, and is collaborating with NOAA on a 2010 field study to examine the nexus between air quality and ,climate change.

Research studies have focused on the technical data needs to develop and adopt Discrete Early Action Measures and for regional resolution of global warming in California. To support greenhouse gas mitigation activities, applied studies are in place for collaborative research on N_20 emissions from nitrogen land application and technical assistance to a voluntary "cool communities" program for promoting near-term reduction of greenhouse gases. ARB has also initiated research to resolve the intensity, distribution, and atmospheric processes associated with particles' climate forcing in California, with an emphasis on vehicular sources and biomass combustion.

Meeting near-term (2020) and long-term (2050) climate goals will require extensive changes in home energy and water use, business operations, and' transportation patterns. Studies already underway will help ARB gauge the effectiveness of strategies designed to encourage voluntary residential reductions in energy consumption. ARB-supported research will also delineate the demographic and behavioral determinants of household consumption of energy, water, natural gas, and transportation resources.

5. Support and Administration

The expansion of ARB's activities associated with AB32 also extends to enforcement, legislative activities, and legal support, as well as increased workload for processing personnel paperwork, contracts and other administrative functions and information technology support.

ARB expanded enforcement resources to address new greenhouse gas measures, and as measures are adopted, resources will continue to shift to ensure smooth implementation of the regulations. As the scope of issues to be addressed by ARB under AB 32 is expansive, ARB legislative scope has also expanded, encompassing issues that in the past have not required significant ARB involvement. ARB has expanded its legislative review and tracking efforts to include additional issues in new program areas including waste management, forestry, agriculture, and the utility sector. Because the implementation of AB 32 presents many novel and complex legal issues, ARB also expanded its legal resources so that legal staff can be in the conception, development, and implementation of programs, such as the mandatory reporting regulations, the Scoping Plan, fee regulations, market mechanisms, and direct reduction measures. In light of the precedent-setting nature of these programs, it is likely that opponents will raise myriad legal issues during program development and implementation.

In the *2007/2008* and *2008/2009* fiscal years, ARB expanded its staff by over 10 percent, increasing the workload of the administrative and information technology units. The administrative unit experienced an initial increase in workload associated with the hiring of new staff. This workload will continue as these staff'will require routine administrative support including personnel transactions, travel reimbursement, processing of contracts, training, and other administrative functions. Similarly, the information technology unit experienced an increase in workload that will continue as these new staff require workstation support, as well as support for the increasingly computer-based outreach methods used by ARB such as webcasts.

California Environmental Protection Agency's **AS** 32 Program Activiti'es

Existing law and Executive Orders direct the Secretary for Environmental Protection to coordinate all state activities related to climate change. To achieve the required emission reductions called for in AB 32, each of the state agencies that are on the Climate Action Team must develop and implement programs within their own jurisdiction and authority. Since 2006, the California Environmental Protection Agency (Cal/EPA) has coordinated all the CAT sub-groups and their AB 32 measures in the Scoping Plan. In addition, CallEPA also produces the Biennial CAT Report that contains the updated assessment of the impacts of climate change in California.

Cal/EPA must also prepare the overarching economic analyses, the multi-state registry framework and the public education program. Furthermore, the Secretary must manage the increased administrative workload associated with additional rulemakings, contracts and procurements, and other matters generated by the CallEPA organizations, particularly ARB.

Additionally, CallEPA is responsible for the Climate Change Report Card, as mandated in statute (SB 85, Chapter 178, statutes of 2007), and the AB 32 Five Year Plans (AB 1338, Chapter 760, statutes of 2008). The climate change unit is also involved in coordinating cross-cutting activities of the Western Climate Initiative as they relate to implementation of AB 32. These activities will continue in fiscal.year *2009/2010.*

Future **AS** 32 Expenditures

In February 2009, the Legislature passed and the Governor signed the fiscal year *2009/2010* budget. This budget included a continuation of funding for ARB and CallEPA to carry out AB 32. For the *2009/2010* fiscal year, the Budget Act (SBX3 1, Chapter 1, Statutes of 2009) includes a $35 million loan from the BCRF for ARB and CallEPA expenditures related to AB 32. ARB will consider this fee regulation in June 2009, and, if approved, fee collection for the *2009/2010* fiscal year will begin in spring 2010. Timely implementation of this Fee regulation could eliminate the need for some or all of the loan for the *2009/2010* fiscal year.

If ARB and Cal/EPA do rely on the loan for some or all of their 2009/2010 expenditures, the fee will be used to repay the loan with interest. These loan repayments would be added to the repayment schedule, and extend final payment of the loans by one year.

Funding Criteria

AB 32 provides ARB with the authority to adopt fees for the broad purpose of "carrying out this division." For the 2009/2010 fiscal year and future fiscal years, ARB proposes to use the following criteria to determine which expenses would be funded from this fee.

- Staff related expenditures for the start-up and ongoing implementation of the AB 32 program that have been approved through budget change proposals (BCPs) after AB 32 was signed into law (September 2006).
- Other post AB 32 BCPs approved costs directly related to the administration of AB 32 programs to reduce greenhouse gas emissions, such as contracts, administrative overhead, and research directly related to the implementation of the AB 32 program.

For the 2009/2010 fiscal year and future fiscal years, ARB proposes that the following types of activities *not* be funded through AB 32 fees:

- Redirected staff positions working on AB 32 that were not approved in the formal budget process with an approved BCP;
- Costs incurred by non-state agencies such as air quality/pollution districts, other special districts, etc;
- Activities which are currently funding a part of an agency's principal responsibilities (water conservation, waste reduction, traffic planning, etc.) that achieve greenhouse gas emission reductions as a co-benefit;
- Specific greenhouse gas emission mitigation activities that started prior to the passage of AB 32 or were covered by earlier budget requests;
- Activities related to adaptation to climate change, including adaptation-related research;
- Activities related to compliance with the California Environmental Quality Act (CEQA) requirements for state agencies related to climate change/greenhouse gas emissions; and,
- Compliance with existing and future programs, regulations or other initiatives for state agencies which reduce their own greenhouse gas emissions.

Funding for AB 32 Implementation in Fiscal Year *2009/2010* Budget

Several other state agencies have been working with Cal/EPA and ARB on AB 32 implementation, including work on the Climate Change Scoping Plan that ARB adopted in December 2008. The Scoping Plan describes a broad range of measures, including many measures that are the primary responsibility of other state agencies. These agencies, which all meet the funding criteria described

above, include: the Department of Food and Agriculture, Energy Commission, Department of General Services, and Integrated Waste Management Board.

Table 8 below provides a preliminary summary of anticipated state agency expenses, including staffing levels, for the AB 32 program for the *2009/2010* fiscal year. Note that the numbers contained in the table are preliminary and subject to change due to potential changes to the adopted *2009/2010* budget during the May revise. A final determination of the required revenue for fiscal year *2009/2010* will be made once final budget information becomes available.

Table 8: Preliminary Summary of
AB 32 Program Funding for FY *2009/2010*

State Agency	PYs	Total Costs (in Million $)
Air Resources Board	155	$ 33.1
Integrated Waste Management Board	6	$ 1.3
Energy Commission	5	$ 0.6
Environmental Protection Agency	4	$ 0.7
Department of General Services	2	$0.2
California Department of Food and Agriculture	2	$ 0.3
TOTAL	174	$ 36.2

A. Air Resources Board

The Air Resources Board's *2009/2010* activities are described above. A summary of ARB's budgeted costs for fiscal year *2009/2010* is shown in Table 9.

Table 9: Summary of ARB's AB 32 Implementation Costs
Fiscal Year *2009/20,10* (Preliminary)

	Costs (Million $)
Staff Related Costs (155 PY)	$22.64
Contracts	$9.50
Equipment	$0.96
Total	$33.10

B. California Environmental Protection Agency

The California Environmental Protection Agency's *2009/2010* activities are described above. A summary of Cal/EPA's budgeted costs for fiscal year 2009/2010 is shown in Table 10.

Table 10: Summary of CalIEPA's AB 32 Implementation Costs
Fiscal Year *2009/2010* (Preliminary)

	Costs (Million $)
Staff Related Costs (4 PY)	$0.75
Contracts	0
Equipment	0
Total	$0.75

C. California Energy Commission

Because energy use is so closely linked to greenhouse gas emissions, the electricity and natural gas sectors will play critical roles in reaching AB 32 goals. In 2008, the Energy Commission and California Public Utilities Commission (CPUC) adopted a comprehensive set of recommendations, which included both programmatic and market-based mechanisms covering a broad range of energy efficiency and renewable energy measures. The Energy Commission identified numerous measures in the Scoping Plan that will be implemented through voluntary programs, new regulations, and other efforts.

Implementing the energy measures and strategies outlined in the Scoping Plan will require developing new building and appliance energy efficiency standards, expanding the use of renewable energy, and tracking associated greenhouse gas emission reductions. The Energy Commission is also working on measures to increase tire efficiency, accelerate the use of alternative transportation fuels and technologies, and explore smarter land use strategies to reduce greenhouse gas emissions. Additionally, staff will analyze California's electricity supply and demand, as well as for the entire western region, as ARB explores a possible regional cap-and-trade program. The Energy Commission is expected to develop forecasts and conduct new analyses to determine potential consequences and greenhouse gas emission impacts from different resource mixes.

A summary of the Energy Commission's budgeted costs for fiscal year 2009/2010 is shown in Table 11.

Table 11: Summary of Energy Commission's AS 32 Implementation Costs
Fiscal Year *2009/2010* (Preliminary)

	Costs (Million $)
Staff Related Costs (5 PY)	$0.59
Contracts	0
Equipment	0
Total	$0.59

D. California Department of General Services

As the State's business manager, the Department of General Services (DGS) has a statewide policy role with respect to building design, construction, operation, and maintenance. Implementing the energy measures and strategies outlined in the Scoping Plan will require DGS to analyze the energy usage data of state facilities and develop new policies and initiatives in order to achieve the targeted greenhouse gas reductions.

DGS not only leads by example, it serves as a catalyst for the development of methods and strategies to lower greenhouse gas emissions associated with the operation of building occupancy. Energy efficiency initiatives led by DGS demonstrate to the utility companies and the private sector the technical feasibility of using advanced technologies in the design, construction, and management of buildings, as well as the commitment of state government to implement public policies in this area. This provides a clear market signal that stimulates private sector action and investment into new technologies.

A summary of DGS's budgeted costs for fiscal year *2009/2010* is shown in Table 12.

Table 12: Summary of DGS's AS 32 Implementation Costs
Fiscal Year *2009/2010* (Preliminary)

	Costs (Million $)
Staff Related Costs (2 PY)	$0.18
Contracts	0
Equipment	0
Total	$0.18

E. California Integrated Waste Management Board

In collaboration with ARB, the California Integrated Waste Management Board (CIWMB) developed several measures in the Scoping Plan that have potential greenhouse gas emission reductions. These measures address landfill methane emissions and moving towards zero waste processes.

The CIWMB assisted ARB in the June 2007 adoption of a Discrete Early Action Measure for increasing landfill methane capture, and is continuing such efforts in the development of the control measure rulemaking expected to be completed during the *2009/2010* fiscal year.

Furthermore, the CIWMB has identified several measures in the Scoping Plan that focus on moving towards zero waste and high recycling by reducing waste and materials at the source of generation, expanding use of compost to benefit soils, and increasing commercial recycling. The CIWMB will also work to ensure that additional emission reductions will be realized through the implementation of the Extended Producer Responsibility measure and the Environmentally Preferable Purchasing measures.

A summary of CIWMB's budgeted costs for fiscal year *2009/2010* is shown in Table 13.

Table 13: Summary of CIWMB's AB 32 Implementation Costs
Fiscal Year *2009/2010* (Preliminary)

	Costs (Million $)
Staff Related Costs (6 PY)	$0.50
Contracts	$0.80
Equipment	0
Total.	$1.30

F. Department Of Food and Agriculture

The California Department of Food and Agriculture (CDFA) is involved with several activities in the agricultural arena to identify and reduce sources of greenhouse gas emissions. In collaboration with ARB, the CDFA is supporting efforts that encourage voluntary installation of anaerobic digesters at large dairies in order to capture methane from manure. The CDFA is also funding research activities to determine baseline nitrous oxide (N20) emission levels from cotton and corn crops with and without nitrogen fertilizer. The CDFA will be collaborating with other state agencies to identify data to estimate the energy use of agricultural water use to reduce energy and related greenhouse gas emissions. Along with ARB and the CEC, the CDFA staff is developing

strategies to remove barriers and promote the adoption of clean farm-based energy technologies, such as bio-gas, bio-fuels, and biomass technologies, and to implement motor fuel quality standards.

A summary of "CDFA's budgeted costs for fiscal year *2009/2010* is shown in Table 14.

Table 14: Summary of CDFA's AS 32 Implementation Costs
Fiscal Year *2009/2010* (Preliminary)

	Costs (Million $)
Staff Related Costs (2 PY)	$0.30
Contracts	0
Equipment	0
Total	$0.30

Funding Process for AS 32 Implementation Fee

To receive funding under this Fee, state agencies would go through the standard Budget Change Proposal (BCP) process of requesting and gaining approval from both the Legislature and Governor.

The proposed process is detailed as follows:

1. Each state agency would prepare and submit a BCP to the Department of Finance (DOF) through their normal budget process."

-2. To assist stakeholders, Cal/EPA would issue a *"Preliminary AB 32 Crosscut Budget Summary"* based on information from DOF and the contents of the Proposed Governor's Budget.

3. After the Legislature passes and the Governor signs the annual budget act, Cal/EPA would issue an *"Approved AB* 32 *Crosscut Budget Summary."* This document would be an update of the *Preliminary AB 32 Crosscut Budget Summary.* This final document would become the basis for the current fiscal year's Revenue Requirement under this regulation.

Appendix D

Default Emissions Factor for Unspecified Electricity Imports

This Page Intentionally Left Blank

Default Emissions Factor for Unspecified Electricity Imports

In order to equitably include greenhouse gas emissions associated with the generation of electricity in the Cost of Implementation Fee (Fee), it is necessary to assign emissions to imported electricity, which accounts for approximately half of total emissions from electricity consumed in California. Sources of imported electricity can be classified as either specified sources or unspecified sources.

Specified sources are particular electricity generation facilities, for which emissions and electricity output is known. For this fee, asset-owning and asset-controlling suppliers that have been assigned a supplier-specific identification number by ARB are treated as specified sources. When electricity is purchased on the market from an unspecified source, actual emissions cannot be precisely known, but an estimated emissions factor can be used, based on the generation facilities and electricity market in the region from which the electricity originates.

Staff proposes to use an emissions factor of 0.499 MTC02 MWh for imported electricity from unspecified sources. This is equivalent to the 1,100 lbs CO_2/ MWh interim emission factor recommended by the California Public Utilities Commission and the California Energy Commission in CPUC Decision 07-09-017 (Decision)11. CPUC and CEC recommend using this emission factor until a regional tracking system for greenhouse gas emissions is in place[12].

The joint agency Decision was the result of a public process to provide recommendations to ARB regarding the reporting and verification of greenhouse gas emissions from the electricity sector. It builds on reporting protocols of the California Climate Action Registry. The Decision recommends that proposed regulations for emissions reporting focusing on entities that are "first-deliverers" of electricity into California's transmission grid. This fee would be applied to retail providers and marketers that are first deliverers of electricity from specified or unspecified sources.

An important issue considered by the energy agencies is how to address electricity transactions classified as "contract shuffling." According to the Decision, "contract shuffling refers to a situation in which a retail provider modifies its power contracts to make it appear that emissions have been reduced whereas in fact, emissions are unchanged." For example, contract shuffling would occur if a California retail provider enters into a contract for power from a specified low-emission facility, but the payments to the supplier are actually used to increase generation at a different plant. Because ARB does not have jurisdiction over the electricity market outside of California, it may not be possible

11 CPUC (California Public Utilities Commission), 2007. Decision 07-09-017: Interim Opinion on Reporting and Verification of Greenhouse Gas Emissions in the Electricity Sector. http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/72513.pdf

12 To date, there is no regional tracking system for greenhouse gas emissions.

to determine if contract shuffling is occurring. This may create a significant barrier to accurate accounting of emissions. It is important that the choice of a default emissions factor not be an incentive for contract shuffling.

Prior to the joint agency Decision, CPUC and CEC staff prepared a joint staff proposal for a reporting protocol for electricity retail providers to report greenhouse gas emissions, and parties provided comments on the proposal[13]. The joint staff proposal recommended separate default emission factors for purchases from separate California Independent System Operator (CAISO) markets, and for unspecified sources in the Pacific Northwest and the Southwest. The proposal recommended a lower emissions factor of 419 lbs C02/MWh for the Northwest based on a mix of generation with a high percentage of hydroelectric power, and a higher emission factor of 1,075 lbs C02/MWh for the Southwest based on marginal electricity generation available for sales from primarily natural gas facilities and a small fraction of coal.

Several parties opposed using different emission factors for different CAISO market pools because they believed this would give marketers incentives that would undermine the efficient operation of electricity markets. Parties also believed that having different emission factors for the Northwest and Southwest would provide an incentive for importers to enter into transactions to hide high-emission sources located in the Southwest by moving power through California to the Northwest and then back into California. State agencies from Oregon and Washington also asserted that hydropower in their states is used primarily for local or regional loads, and that power generated from natural gas or coal is exported to California. They recommended a default emission factor of 1,0621bs C02/MWh for the Northwest.

The joint energy agencies decided to use the conservative default emission factor of 1,100 lbs C02/MWh. This relatively high factor would help discourage high-emitting resources from characterizing themselves unspecified resources. Such a factor also would encourage marketers and retail providers to specify their sources of power, improving accuracy in emissions reporting. Using a relatively high default emissions factor would also reduce contract shuffling opportunities. In contrast, a low default emission factor could increase purchases from high-emitting resources by encouraging such sources to market themselves as unspecified sources. The 1,100 lbs C02/MWh emission factor is close to the regional average for the western states and higher than emission factors for most modern natural gas combined cycle facilities. With a default emission factor of 1,100 lbs C02/MWh, marketers that can specify their lower-emission sources will be encouraged to do so, so that imports from those facilitieswill have a specific emission factor.

13 Murtishaw, Scott, and Karen Griffin, Joint California Public Utilities Commission and California Energy Commission Staff Proposal for an Electricity Retail Provider GHG Reporting Protocol, June 12,2007, downloaded on March 30, 2009 from ftp:/lftp.cpuc.ca.gov/puc/energy/electric/climate+change/Joint+Staff+GHG+Reporting+Proposal.pdf

Finally, asset-owning and asset-controlling suppliers that meet ARB's mandatory reporting requirements for a supplier-specific identification number will also be able to be treated as specified sources. The CPUC and CEC joint staff report recommends a methodology for ARB to use in calculating emission factors for these entities. This methodology is the same as that used by ARB for calculating regional emission. factors, as described in the technical report for the mandatory reporting regulation[14]. In this methodology, an emission factor for an asset-owning or asset-controlling supplier is the weighted average of emission factors of the supplier's generating facilities and purchased electricity. When part or all of the supplier's purchased electricity is from unspecified sources, that portion is assigned the default emission factor. Staff propose that ARB use this methodology for calculating emission factors for asset-owing and asset-controlling suppliers. Using these supplier-specific emission factors will result in a smaller fraction of imported electricity being assigned the default emission factor.

For the reasons discussed above, staff propose that ARB adopt the stated default emission factor for use in determining the cost-of-implementation fee for unspecified *imported* electricity. ARB staff recognize that as the development of California's cap-and-trade regulation proceeds, and as experience is gained with the mandatory reporting of emissions, other methods for calculating default emission factors may be needed. Furthermore, better methods of tracking and specifying emissions associated electricity purchased across state lines are likely to be developed. By proposing the adoption of the CPUC and CEC recommended interim default emission·factor, staff does not intend to set a precedent for future regulations. After the Cap and Trade regulatory process has determined appropriate emission factors to be used to determine compliance obligation, staff would expect to revisit emission factors used for this fee.

[14] Appendix A of the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions.

This Page Intentionally Left Blank

'Appendix E

Total In-State Greenhouse Gas Emissions in 2006

This Page Intentionally Left Blank

Total In-State Greenhouse Gas Emissions in 2006

Sector	Emission Type	Details	Total MMTC02E	% Sector	% Total
Transportation	Fuel	Gasoline	142.2	76.5%	29.6%
		Distillate	37.5	20.2%	7.8%
		Residual fuel oil	2.4	1.3%	-0.5%
		Jet fuel	1.4	0.7%	0.3%
		Natural gas	0.6	0.3%	0.1%
		LPG	0.5	0.3%	0.1%
		Aviation gasoline	0.2	0.1%	0.0%
	Fugitive	Lubricant Losses	1.0	0.5%	0.2%
		Total	185.8		38.7%
Electricity Generation (In State)	Fuel	Natural gas	47.6	20.2%	9.9%
		Petroleum coke	2.4	1.0%	0.5%
		Coal	2.4	1.0%	0.5%
		Refinery gas	1.1	0.5%	0.2%
		MSW	0.3	0.1%	0.1%
		Biomass	0.1	0.0%	0.0%
		Distillate	0.1	0.0%	0.0%
		Waste oil	0.1	0.0%	0.0%
		Jet fuel	0.0	0.0%	0.0%
		Tires	0.0	0.0%	0.0%
		Crude oil	0.0	0.0%	0.0%
		Residual fuel oil	0.0	0.0%	0.0%
		Landfill gas	0.0	0.0%	0.0%
		Digester gas	0.0	0.0%	0.0%
		Propane	0.0	0.0%	0.0%
	Fugitive	Geothermal	2.0	0.9%	0.4%
		SF_6	0.7	0.3%	0.1%
		Total	57.0		11.9%
Electricity Generation (Imports)	Fuel	Coal	25.3	10.7%	5.3%
		Natural gas	0.1	0.0%	0.0%
		Distillate	0.0	0.0%	0.0%
		Residual fuel oil	0.0	0.0%	0.0%
		Unspecified Imports	24.3	10.3%	5.1%
	Fugitive	SF_6	0.3	0.1%	0.1%
		Total	49.9		10.4%
Industrial	Fuel	Natural gas	37.4	36.4%	7.8%
		Refinery gas	19.5	19.0%	4.1%
		Catalyst coke	6.1	6.0%	1.3%
		Coal	5.9	5.7%	1.2%

		Petroleum coke	4.0	3.8%	0.8%
		Associated gas	3.2	3.1%	0.7%
		Gasoline	2.5	2.5%	0.5%
		LPG	1.3	1.3%	0.3%
		Naphtha	0.7	0.7%	0.1%
		Distillate	0.7	0.6%	0.1%
		Other petroleum products	0.2	0.2%	0.0%
		Tires	0.2	0.2%	0.0%
		Residual fuel oil	0.1	0.1%	0.0%
		Wood	0.1	0.0%	0.0%
		Waste oil	0.0	0.0%	0.0%
		Crude oil	0.0.	0.0%	0.0%
		Biomass	0.0	0.0%	0.0%
		Kerosene	0.0	0.0%	0.0%
		Propane	0.0	0.0%	0.0%
		Biomass waste fuel	0.0	0.0%	0.0%
	Fugitive	Landfills	6.3	6.1%	1.3%
		Lubricant Losses	0.7	0.7%	0.2%
		Manufacturing	1.2	1.2%	0.3%
		Oil & Gas Extraction	0.8	0.7%	0.2%
		Petroleum Refining	0.0	0.0%	0.0%
		Pipeline Losses	1.9	1.8%	0.4%
		Wastewater Treatment	2.9	2.8%	0.6%
	Process Emissions	Cement Clinker Production	5.8	5.6%	1.2%
		Manufacturing	1.3	1.2%	0.3%
		Total	102.9		21.4%
Residential	Fuel	Natural gas	26.4	84.9%	5.5%
		LPG	4.3	13.8%	0.9%
		Wood	0.2	0.7%	0.0%
		Kerosene	0.1	0.4%	0.0%
		Distillate	0.1	0.2%	0.0%
		Total	31.1		6.5%
Commercial	Fuel	Coal	11.6	87.7%	2.4%
		Crude oil	0.8	5.7%	0.2%
		Digester gas	0.7	5.1%	0.1%
		Distillate	0.1	0.8%	0.0%
		Gasoline	0.0	0.4%	0.0%
		Kerosene	0.0	0.2%	0.0%
		Landfill gas	0.0	0.2%	0.0%
		LPG	0.0	0.0%	0.0%
		Natural gas	0.0	0.0%	0.0%
		Wood	0.0	0.0%	0.0%
		Total	13.2		2.8%
Agriculture &	Fuel	Distillate	3.8	14.6%	0.8%

Forestry					
		Natural gas	0.8	3.1%	0.2%
		Gasoline	0.6	2.1%	0.1%
		Kerosene	0.0	0.0%	0.0%
	Fugitive	Crop Emissions	9.2	35.0%	1.9%
		Livestock	15.7	59.8%	3.3%
	Managed Burning	Ag Burning	0.1	0.3%	0.0%
		Forest & Rangeland Burning	0.2	0.7%	0.0%
	Net CO2' Flux	Net C02 Flux	-4.1	15.5%	-0.8%
		Total	26.2		5.5%
Not Specified	Fugitive	High GWP	13.4	99.0%	2.8%
		Solvent Evaporation	0.1	1.0%	0.0%
		Total	13.5		2.8%
Grand Total			479.7		100.0%

Source: Air Resources Board, 2006 Greenhouse Gas Inventory

TITLE 13. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO ADOPT PROPOSED AB 118 ENHANCED FLEET MODERNIZATION PROGRAM REGULATION (CAR SCRAP)

The Air Resources Board (ARB or the Board) will conduct a public hearing at the time and place noted below to consider adoption of the proposed AB 118 Enhanced Fleet Modernization Program Regulation (Car Scrap).

DATE: June 25-26, 2009

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the Board, which will·commence at 9:00 a.m., June 25,2009, and may continue at 8:30 a.m., on June 26,2009. This item may not be considered until June 26, 2009. Please consult the agenda for the meeting, which will be available at least 10 days before June 25,2009, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by fax at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. *TTYrrDD/Speech* to Speech users may dial 711 for the California Relay Service.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected:

Proposed adoption of California Code of Regulations, title 13, new sections 2620, 2621, 2622,2623,2624,2625, 2626,2627,2628,2629, and 2630.

Background:

In October 2007, Governor Schwarzenegger signed Assembly Bill 118 (AB 118 [Nunez, Statutes 2007, chapter 750), into law. This legislation provides approximately $200 million annually for new programs to improve air quality through the development and use of advanced technologies as well as alternative and renewable fuels. The legislation includes $30 million annually for an Enhanced Fleet Modernization Program (EFMP).

The EFMP will augment the State's existing State voluntary accelerated vehicle retirement program, referred to as the Consumer Assistance Program.

The focus of the EFMP is to augment existing retirement programs and provide funding to retire the highest polluting vehicles in the areas with the greatest air quality problems. The legislation also directs that the program consider flexible compensation related to the replacement of the vehicles being retired, and requires ARB to consider cost-effectiveness and impacts on disadvantaged and low-income populations.

Proposed Regulation:

There are two main features to the proposed rulemaking. First, the proposal would remove existing State requirements that vehicles must be subject to and fail Smog Check in order to participate. These modifications greatly expand the vehicle population that can be retired in any given year and are projected to result in the retirement of up to 15,000 vehicles annually when fully funded. Incentives for vehicle retirement would be available statewide at $1,000 per vehicle or $1,500 for low-income participants.

Second, staff is proposing a pilot voucher program that would target the highest-emitting vehicles and ensure their replacement with newer, cleaner vehicles. Solicited consumers would retire their vehicle at a dismantler and receive both immediate compensation for vehicle retirement and additional incentives in the form of a redeemable voucher to be used at participating vehicle dealerships. Staff proposes that the voucher compensation be $2,000 to $2,500 per vehicle depending on income level. Staff is also proposing that income-eligible participants be able to choose from a wider pool of replacement vehicles.

To start, the pilot voucher program would only be available in the South Coast and San Joaquin Valley air basins, which are areas with specific'vehicle retirement commitments in the State Implementation Plan·and areas with the worst air quality. A su'mmary of the proposed incentives is provided in the table below.

Consumer	Retirement Incentive	Replacement Voucher	Total Incentives	Replacement Model Years (rolling)
All	$1,000	$2,000	$3,000	Newest 4 Model Years
Income-Eligible	$1,500	$2,500	$4,000	Newest 8 Model Years

Total emission benefits for the program are estimated to be approximately 1.6 tons of hydrocarbons and oxides of nitrogen each day when fully funded.

COMPARABLE FEDERAL REGULATIONS

There are no federal regulations comparable to the proposed regulation. The proposed regulation defines the EFMP structure and establishes administrative and implementation requirements. Participation by individuals *and* businesses in the EFMP is strictly voluntary.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the economic and environmental impacts of the proposal. The report is entitled: "Staff Report: Initial Statement of Reasons for Proposed Rulemaking - Proposed Regulations for an Enhanced Fleet Modernization Program (Car Scrap)."

Copies of the ISOR and the full text of the proposed regulatory language may be accessed on ARB's website listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990, at least 45 days prior to the scheduled hearing on June 25, 2009.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to Mr. Tom Evashenk, Air Resources Engineering Associate, at (916) 445-8811 or Mr. John Ellis, Air Resources Engineer, at (626) 350-6516.

Further, the agency representative and designated back-up contact persons, to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Lori Andreoni, Manager, Board Administration & Regulatory Coordination Unit, (916) 322-4011, or Ms. Trini Balcazar, Regulations Coordinator, (916) 445-9564. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR and all subsequent regulatory documents, including the FSOR, when completed, are available on ARB's website for this rulemaking at: www.arb.ca.gov/regact/2009/carscrap09/carscrap09.htp

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulations are presented below.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would create slight costs to ARB in the implementation of the EFMP. Funding for these positions has been included in the California State Budget. Except for these costs, the proposed regulatory action would not create costs or savings to any other State agency, or in federal funding to the State, costs or mandate to any local agency or school district whether or not reimbursable by the State pursuant to Government Code, title 2, division 4, part 7 (commencing with section 17500), or other nondiscretionary cost or savings to State or local agencies.

In developing this regulatory proposal, ARB staff evaluated the potential economic impacts on representative private persons or businesses. The ARB is not aware of any cost impacts that a representative private person or business would necessarily incur in reasonable compliance with the proposed action. The EFMP is purely voluntary. Businesses, individuals, and public agencies will not participate unless it is economically beneficial for them to do so.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states, or on representative private persons.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action which sets implementation requirements for the EFMP would have a slight positive impact on the creation of jobs within the State of California. The types of businesses that will benefit include licensed dismantlers and new or used car dealerships. For dismantlers, this program will increase the number of vehicles scrapped and for car dealerships stimulate vehicle sales, thus increasing revenues to both entities. An assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to California Code of Regulations, title 1, section 4, that the proposed regulatory action would affect small businesses. Although participation in the EFMP is strictly voluntary with and there are no mandated requirements, small businesses that choose to participate in the EFMP would be affected by enforcement of the regulation.

The proposed regulation will not impose reporting requirements on private persons or businesses.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the board or that has otherwise been identified and brought to the attention of the Board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or iii writing at the meeting, and in writing or by email before the meeting. To be considered by the Board, written comments, not physically submitted at the meeting, must be received **no later than 12:00 noon, Pacific Standard Time, June 24, 2009,** and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Gov. Code, § 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require, that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

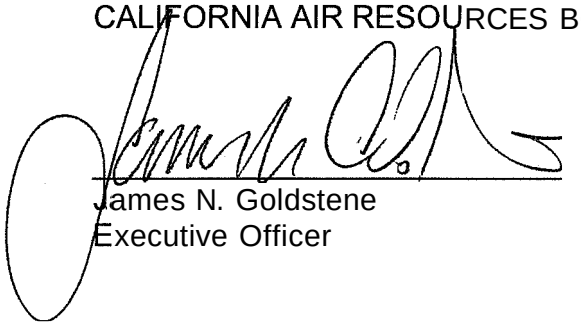
This regulatory action is proposed under that authority granted in Health and Safety Code sections 39600, 39601, and 44125. This action is proposed to implement, interpret and make specific Health and Safety Code sections 39600, 39601, and 44125.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, Government Code, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340).

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with non-substantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice and that the regulatory language as modified could result from the proposed regulatory action; in such event, the full regulatory text, with the modifications clearly indicated, will be made available to the public, for written comment, at least 15 days before it is adopted, and the public may request a copy of the modified regulatory text from ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, First Floor, Sacramento, California, 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD



James N. Goldstene
Executive Officer

Date: April 28, 2009

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.

State of California
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public'Meeting to Consider Regulations for an Enhanced Fleet Modernization Program (Car Scrap)

Date of Release: May 8, 2009
Scheduled for ,Consideration: June 25, 2009

TABLE OF CONTENTS

Executive Summary

Voluntary accelerated vehicle retirement or "car scrap" programs provide monetary incentives to vehicle owners to retire older, more polluting vehicles. The purpose of these programs is to reduce fleet emissions by accelerating the turnover of the existing fleet and subsequent replacement with newer, cleaner vehicles. Reducing emissions from the existing fleet is a component of California's State Implementation Plan, which outlines the State's strategy for meeting health-based ambient air quality standards.

Background

There are currently over one million vehicles retired every year as part of normal fleet turnover in California. California's low-emission neW car standards are dependent on this natural turnover for significant emission reductions. However, extra emission reductions benefits can be achieved through the early retirement of fully functional but high emitting vehicles. An existing State vehicle retirement program retires roughly 22,000 older vehicles annually and local air districts scrap an additional 5,000 vehicles, primarily for air quality benefits.

Reducing emissions from the existing fleet is an important part of California's strategy to meet health-based ambient air quality standards. A disproportionate amount of the light-duty fleet emissions are from older, high-emitting vehicles. By 2010, vehicles 15 years and older will account for about 20 percent of the fleet (and about 14 percent of the miles traveled), but still be .responsible for over 62 percent of the smog-forming emissions from cars.

California's mild climate contributes to the longer survival rates of the state fleet. About half of all light-duty vehicles survive at least 15 years and one-quarter at least 20 years. However, of those that survive 20 years, about 40 percent will still be in use at least 10 more years. And due to economic conditions, consumers are holding onto older vehicles with greater frequency. Providing monetary incentives can provide the necessary and cost-effective "push" for retiring many of these older, inherently higher-emitting vehicles.

Enhanced Fleet Modernization Program

In October 2007, Governor Schwarzenegger signed Assembly Bill 118 (Nunez, Chapter 750, Statutes of 2007) into law. This legislation provides approximately $200 million annually for new programs to improve air quality through the development and use of advanced technologies as well as alternative and renewable fuels. The legislation also includes roughly $30 million annually for an Enhanced Fleet Modernization Program (EFMP) to augment the State's existing voluntary accelerated vehicle retirement program (the existing Consumer Assistance Program is administered by the Bureau of Automotive Repair and provides $1,000 for the

voluntary retirement of vehicles failing their most recent Smog Check). This rulemaking provides the regulatory framework for implementing the EFMP as required byAB118.

Proposal Overview

There are two main features to the proposed rulemaking. First, the proposal would provide incentives statewide for vehicles not currently eligible under the Consumer Assistance Program by removing the existing requirements that vehicles be *subject.to* and *fail* Smog Check to participate. Allowing vehicles that are not currently undergoing registration or that have passed their Smog Check to participate greatly expands the vehicle population that can be retired in any given year and is projected to result in the retirement of up to 15,000 vehicles annually when fully funded. Participants would receive $1,000 per vehicle or $1,500 per vehicle if they meet low-income requirements.

Second, the proposal would establish a pilot voucher program in the South Coast and San Joaquin Valley air basins that targets the highest-emitting vehicles and requires their replacement with newer, cleaner vehicles. The local air districts would work behind the scenes with the Bureau of Automotive Repair (BAR) to determine vehicle eligibility and low-income status. Once approved, the districts would provide the applicant a Letter of Eligibility from BAR and a redeemable voucher. Consumers would retire their vehicle at a participating dismantler, receiving immediate compensation for vehicle retirement. Consumers could then redeem their voucher at participating dealerships toward the purchase of a replacement vehicle. Staff proposes that the voucher compensation be $2,900 or $2,500 per vehicle depending on income level. Staff is also proposing that income eligible participants be able to choose from a wider pool of replacement vehicles. A summary of the proposed incentives is provided in the table below.

Proposed Program Incentives

Consumer	Retirement Incentive	Replacement Voucher[1]	Total Incentives	Replacement Model Years (rolling)
All	$1,000	$2,000	$3,000	Newest 4 Model Years
Income Eligible[2]	$1,500	$2,500	$4,000	Newest 8 Model Years

1 Available in South Coast and San Joaquin air basins
2 Income not to exceed 225 percent of the federal poverty limit

Though the proposed regulations would significantly expand existing vehicle eligibility requirements, most functional and operational requirements would be consistent with the State's existing program. For example, eligible vehicles would have to pass the

same visual and functional inspections and be retired at dismantlers under contract to the Bureau of Automotive Repair. Additional flexibility is, however, provided to the registration requirements currently in place to enable wider participation.

The proposed pilot voucher program is groundbreaking for the State to administer. Consequently, ARB staff will monitor the program closely to determine if changes are needed, including an expansion of the voucher component.

Proposed EFMP Benefits

At the anticipated funding level of $30 million annually, the proposal is expected to result in the early retirement of up to 15,000 vehicles statewide each year, nearly doubling the existing State program. In addition, the proposal provides the framework and budget for a voucher program designed to fund up to 3,500 participants per year. Based on these projections, the total emission benefits of the program are estimated to be up to 1.6 tons of hydrocarbons and oxides of nitrogen each day when fully funded. The available funding in the first year is $16.4 million, which is sufficient to retire about 9,500 vehicles and provide 1,300 vouchers.

The proposed program is voluntary and does not require participation by consumers or businesses. For businesses choosing to participate," the program is expected to provide modest positive impacts. Businesses that will benefit include licensed dismantlers and new or used car dealerships due to the increase in vehicles scrapped and the expected increase in vehicle sales at car dealerships.

Cost-effectiveness reflects the cost incurred per ton of pollution reduced and is used to ensure that State funds are spent efficiently and achieve the maximum air quality benefit. The legislation directs that cost-effectiveness be considered but does not specify a limit. As proposed, the overall cost-effectiveness of the program is estimated to be $16,000 per ton. The most costly element, greater incentives for income-eligible participants, generally exceeds the cost-effectiveness of other incentive programs. However, providing greater incentives for income-eligible participants is justified by their need for additional support to purchase newer vehicles, and the legislative direction.

Staff Recommendation

The ARB staff recommends that the Board adopt the regulations as proposed in this Initial Statement of Reasons. The proposal meets the legislative direction to expand the State's existing vehicle retirement program to specifically target the highest polluting vehicles in the areas with the greatest air quality problems. The proposal takes into consideration flexible compensation related to the replacement of the vehicles being retired and the impacts to low-income populations.

Introduction

Air pollution is a serious problem for California - over 90 percent of Californians live in areas that have unhealthy air at times. Air pollution has been tied to serious health impacts. Research in Southern California shows that children exposed to unhealthful levels of ozone, or smog, suffer decreased lung function growth and increased asthma. In addition, recent evidence has linked the onset of asthma with exposure to elevated ozone levels in exercising children.

The emissions that cause smog come from a multitude of sources - cars, trucks, and industrial sources, as well as hairspray, lawnmowers, and paints. One of the prime contributors to air pollution in California is the automobile. Although new cars are over 97 percent cleaner than their uncontrolled predecessors, in 2010, almost 20 percent of the smog-forming emissions in the Los Angeles area will still be caused by cars, minivans, pick-up trucks, and sport-utility vehicles.

A disproportionate amount of these emissions are from older, high-emitting vehicles. For example, by 2010, vehicles 15 years and older will account for about 20 percent of the fleet (and about 14 percent of the miles traveled), but still be responsible for over 60 percent of the smog-forming emissions from cars. In California, about half of all cars survive at least 15 years and one-quarter to at least 20 years. However, it is interesting to note that of those cars that do survive to 20 years, about 40 percent of those will survive at least 10 more years. Clearly, reducing emissions from the existing light-duty fleet is an important part of California's strategy to meet the health based ambient air quality standards.

In response to these issues, the ARB has developed program guidelines for vehicle retirement for use by local air districts. Although voluntary accelerated vehicle retirement (VAVR) programs operate in several areas of the State, the programs have not achieved their full potential because they have not been funded at the originally anticipated levels. AB 118 recognized this deficiency and responded by provided additional funding through 2015 to specifically target the highest emitting vehicles in areas with the worst air quality.

Existing Retirement Programs

State and local programs exist and are governed by basic rules established by the ARB. To qualify, vehicles meet registration, functionality, and equipment eligibility criteria. The important distinction between the local and State program is that the local programs generate mobile source emission reduction credits that can be retired for clean air, or traded and sold. In contrast, the BAR scrap program is not used to generate tradable emission credits. A review of these programs is helpful in putting the proposed rulemaking into context.

Statewide Consumer Assistance Program: The state currently provides $1,000[1] through the Bureau of Automotive Repair's (BAR's) Consumer Assistance Program (CAP) for the retirement of vehicles that did not pass their most recent Smog Check. Typically, these are older vehicles, but there is not a specific range of model years targeted by the program[2]. Any vehicle that has failed the Smog Check test (and has met registration and physical condition requirements) is eligible. Although there are air quality benefits, the objective of CAP is to provide options, both vehicle retirement and repair assistance, for Californians facing difficulties in registering their vehicles resulting from a failing Smog Check. The program is only available during the Smog Check cycle and for vehicles that fail the test.

A total of 88,000 vehicles have been retired since the program's inception and demand has historically exceeded available-funds. In addition, 235,000 vehicles have received repair assistance since the program's inception.

Local Car Scrap Programs: Local air districts also administer programs that provide incentives to voluntarily retire older vehicles. District programs are referred to as Voluntary Accelerated Vehicle Retirement (VAVR) programs. The five air districts that currently operate programs include Antelope Valley Air Pollution Control District (APCD), Bay Area Air Quality Management District (AQMD), San Joaquin Valley APCD, Santa Barbara County APCD, and the South Coast AQMD. Although the incentive amounts are fairly similar to CAP, with incentives in the $650 to $1,000 range, VAVR programs do not strictly overlap with the state program since the vehicles participating in district programs must be outside of the registration renewal cycle and had to have passed their last Smog Check to be eligible. VAVR programs are typically operated with state or local incentive funds, although the South Coast AQMD operates a privately funded program that generates mobile source offset credits.

District VAVR programs have retired substantially fewer vehicles than the State's CAP program. The Bay Area AQMD operates the largest VAVR program, retiring over 4,000 vehicles each year.

There are also two other more recently initiated vehicle retirement programs which are operated by local air districts and designed to retire probable gross-polluting vehicles. Both programs are pilot programs that are limited in scope and funding compared to the programs discussed above. The South Coast AQMD operates a program called High Emitter Repair or Scrap (HEROS) that uses mobile remote sensing equipment to identify gross polluters and then solicits voluntary participation through the offer of compensation for repair or retirement. The San Joaquin Valley APCD operates the REMOVE II program by soliciting owners of vehicles that are targeted as probable high emitters based on Smog Check test data. Although very limited in size to date, REMOVE II is the only program in the state to currently offer

1 BAR is in the process of amending the program to provide $1,500 to low-income participants.
2 Pre-1976 model year vehicles are not subject to Smog Check and are thus ineligible for CAP.

incentives based on the purchase of a replacement vehicle. Table 1 provides a summary of the state and district vehicle scrap programs.

Table 1: Existing State and Local Car Scrap Program

Entity	Vehicles Accepted	Incentive
BAR	1976 and newer	$1,000[1]
Antelope Valley	1988 and older	$900[2]
Bay Area	1987 and older	$650[2]
San Joaquin Valley (REMOVE II)	Targeted High Emitter	$1,000 $5,000 with LEV II re lacement
Santa Barbara	1988 and older	$800
South Coast	1994 and older	$500 to $1,000
South Coast HEROS	Gross Polluter	$2,000

BAR is in the process of amending CAP to provide $1,500 to low-income participants.
2 The district is in the process of increasing their retirement incentive to $1,000.

Collectively, all of these existing programs are not sufficient in scope or funding[3] to meet the State Implementation Plan (SIP) commitments for vehicle retirement. Vehicle retirement programs have consistently been included in the State's clean air plans due to their cost-effectiveness, but funding has been a chronic problem.

The 2007 SIP includes a commitment to expand the State's existing program to achieve reductions equivalent to the early retirement of 50,000 and 10,000 vehicles per year in the South Coast and San Joaquin Valley air basins, respectively. These totals represent about half of one percent of the vehicles subject to Smog Check in each region. The annual retirement of 60,000 vehicles would provide emission benefits equal to 2 percent of light-duty vehicles emissions in 2014. The funds allocated under AB 118 represent a "down-payment" on the SIP commitment by providing enough funding to retire roughly one-fourth of the total needed to meet the emission reductions identified for vehicle retirement in the SIP.

Overview: Enhanced Fleet Modernization Program

The proposed Enhanced Fleet Modernization Program (EFMP) is a voluntary vehicle retirement program authorized by AB 118 (Nunez, Chapter 750, Statutes of 2007[4], section 44125(a)). The purpose of the legislation is to augment the State's existing vehicle retirement programs by targeting the highest emitting vehicles in the areas with the worst air quality. Funding for the program is provided via a $1 increase in

3 Combined annual expenditures for district programs are approximately $6 million.
4 A copy of the legislation pertaining to EFMP is contained in Appendix B.

vehicle 'registration fees and totals roughly $30 million annually through 2015. The program will be administered by BAR, beginning April 1, 2010. AB 118 establishes six significant design criteria or guidelines for the new program:

1) Retired vehicles must be permanently removed from operation by a dismantler under contract with the BAR
2) Districts retain their authority to administer vehicle retirement programs
3) The program will target high polluting passenger vehicles, light-duty and medium-duty trucks that have been continuously registered[5] in California for two years
4) The program shall be focused where the greatest air quality impact can be identified
5) Compensation is flexible, depending on emissions, age and replacement vehicle factors
6) Cost-effectiveness and impacts on disadvantaged and low-income populations shall be considered

The Legislature specifically provided greater program flexibility by placing the EFMP within Article 11 of the California Health and Safety Code, independent of the requirements of either the CAP or VAVR authorizing legislation. While AB 118 directs that districts retain their authority to administer existing VAVR programs, the proposal will impact these programs by competing for many of the pool of vehicles[6]. With that· said, the EFMP proposal is designed to provide consistency with existing programs where possible while still addressing the specific directives contained within the legislation.

Public Outreach

ARB staff conducted four workshops in support of the proposed regulation. Notices of each workshop were sent to list serves established for the program, and workshops were webcasted when technically feasible to allow remote participation. At the first workshop in May 2008, ARB staff provided background on legislative directions of AB 118, existing State and local programs, and the plans for regulatory development of the EFMP. At the second and third workshops in September and December 2008, ARB staff presented draft regulatory concepts. During the last workshop in March 2009, staff presented the final program concepts and draft regulatory language for public comment. Workshop attendees emphasized the need for program simplicity and greater flexibility for low-income populations.

Throughout the regulatory process, ARB staff worked with stakeholders to refine the proposal and to respond to the concerns raised. Regular coordination meetings were

5 AS 118 provides some flexibility by allowing that vehicles either be continuously registered for two years or otherwise proven to have been driven primarily in California for two years and not registered in any other state

6 In response, some'districts are in the process of modifying their programs to increase the amount offered to be consistent with CAP and to remove any inherent advantages to the proposed program.

held with BAR staff, but ARB staff also met with representatives from the South Coast AQMD, San Joaquin Valley APCD, Bay Area AQMD, the Clean Air Dialogue Working Group of the California Environmental Dialogue, the California New Car Dealers Association, and car dismantlers. Extra outreach was also taken to ensure that those representing environmental justice communities were aware of the regulatory process.

ARB staff endeavored to craft a regulation thataddressed as many issues as possible while retaining the goal of maintaining a balance between flexibility and the requirement that emission reductions from vehicle retirement be real, surplus, quantifiable, and enforceable.

Summary of the Proposed Regulation

The purpose of the proposed rulemaking is to improve California air quality through the voluntary retirement of light- and medium-duty vehicles. The proposed program will be administered by BAR through contracts with dismantlers, air districts and other entities, as appropriate. A discussion of the program's main elements and their rationale is provided below. The proposed regulatory text is contained in Appendix A.

Eligibility Requirements

As directed by AB 118, the propqsed regulation would provide greater flexibility for program participation than currently allowed under existing programs. For example, the proposal does not restrict participation based on model year? Concerning vehicle class and size, the staff proposal would increase the existing weight limit[8] of CAP and VAVR programs to 10,000 pounds gross vehicle weight and allow medium-duty vehicles to participate. The expanded flexibility increases the pool of eligible vehicles and responds to legislative direction that medium-duty trucks be included.

To ensure real and surplus reductions, existing state and local programs require that vehicles be registered in California for the previous two years. This requirement limits participation and excludes in some cases extremely high emitting vehiCles. AB 118 provides flexibility by specifically expanding eligibility to unregistered vehicles that can otherwise prove to have been driven primarily in California for two years and not registered in any other state.

In response to this direction, ARB staff proposes to allow unregistered vehicles with proof of ownership and proof of use in California to participate. Proof of use would include, but not be limited to, insurance or repair receipts tied to an address in California for a period of no less than two years. Staff also proposes to relax the requirement that vehicles be continuously registered for the preceding two years to be consistent with the flexibility allowed under the VAVR programs. Under VAVR

7 CAP does not include pre-1976 vehicles; VARY programs do not include vehicles generally newer than 1990.

B CAP and VAVR programs are limited to vehicles under 8,500 pounds gross vehicle weight.

programs, a vehicle may be eligible if the vehicle has been placed in planned non-operational status for a total of two or few months during the two-year period. Due to the relatively large incentives for the pilot voucher program, ARB staff proposes to limit the program to one voucher per person.

Program Incentives

There are two main features of the proposed EFMP. First, the proposal significantly expands the existing statewide program by removing the requirements that vehicles be *subject* to Smog Check and *fail* in order to participate. Second, additional compensation would be made available to consumers with "targeted" vehicles in areas with the most severe air quality to incentivize the retirement of probable gross polluting vehicles along with the purchase of newer, cleaner vehicles.

Incentives for Early Retirement Only

The first feature, expansion of the existing retirement program would be available statewide and include vehicles that have been declined from the CAp[9] program for administrative reasons and vehicles that are not currently subject to biennial Smog Check. This expansion of the existing retirement program is a significant change because a given vehicle would be eligible for retirement at any time, not just within 120 days of failing a Smog Check test. The potential increase in eligible population and decrease in program restrictions is large. BAR staff estimates that 7,500 vehicles declined from the CAP program for administrative reasons alone would be eligible for EFMP incentives.

ARB staff proposes that the general incentive for EFMP be $1,000 per vehicle and $1,500 per vehicle for low-income consumers. The proposed incentive levels are consistent with the CAP program and will provide enough compensation to ensure robust program participation. The combination of additional funds and greatly expanded eligible population under EFMP is expected to nearly double the number of vehicles currently retired each year by BAR.

Replacement Incentives for Targeted Vehicles

AB118 also directs that flexibility be considered in providing compensation and be based on factors including, but not limited to, vehicle age, emission benefits of the vehicle's retirement, emissions impact of any replacement vehicle, and location of vehicles in areas of the state with the poorest air quality. ARB staff proposes that BAR target probable high emitters through direct mailing in areas with the greatest air quality problems and offer additional incentives for replacement with newer, cleaner

9 The state currently provides $1,000 through CAP for the retirement of vehicles that did not pass their most recent Smog Check. The objective of CAP is to prOVide options, both vehicle retirement and repair assistance, for Californians facing difficulties in registering their vehicles due to emissions-related issues resulting from a failing Smog Check.

vehicles. Only targeted vehicles would be eligible for an additional incentive for vehicle replacement.

The targeted, probable high emitter population consists of an estimated 300,000 pre-1976 vehicles, about 200,000 light-duty and medium-duty diesel vehicles and an additional large population of the highest emitting vehicles of the High Emitter Profile (HEP) database, as identified by BAR. Staff also proposes that districts be'allowed to identify voucher program participants by other approved approaches including remote sensing.

Targeted vehicles will on average have higher baseline emissions than those in conventional retirement programs where the vehicles are selected by model year alone. Because targeted vehicles are probable gross polluters, additional funds can be made available for a cleaner replacement vehicle while still maintaining acceptable cost effectiveness. Targeting gross polluters and providing a replacement incentive for a sufficiently new vehicle allows mitigation of one of the historic criticisms of voluntary vehicle retirement programs: the assumption of a cleaner replacement vehicle.

The proposed incentives for the pilot voucher program are shown in Table 2. Ideally, only the newest and cleanest vehicles would be allowed as replacement vehicles. However, given financial considerations, staff proposes to require that the replacement vehicle be of the most recent four model years. This flexibility allows for much lower cost to the consumer while still resulting in the purchase of a vehicle meeting the ARB's Low Emission Vehicle /l standards[10].

The proposal is structured to provide greater funding and flexibility to low-income participants to allow them to get into a newer vehicle at a manageable cost. Low-income populations are given the flexibility to replace their vehicles with an eight year or newer model certified to at least LEV I standards. By 2014, all low-income eligible owners will purchase vehicles certified to LEV /l standards. These provisions provide certainty that only significantly cleaner, less polluting vehicles will be used as replacements.

Table 2: Proposed Program Incentives

Consumer	Retirement Incentive	Replacement Voucher	Total Incentives	Replacement Model Years (rolling)
All	$1,000	$2,000	$3,000	Newest 4 Model Years
Income Eligible	$1,500	$2,500	$4,000	Newest 8 Model Years

[10] By 2007, essentially all vehicles will be certified under LEV II.

To start, ARB staff proposes that vouchers be available only in the South Coast and San Joaquin Valley air basins. If successful and more funds are available, the voucher program would be expanded to other areas, including the Bay Area air basins.

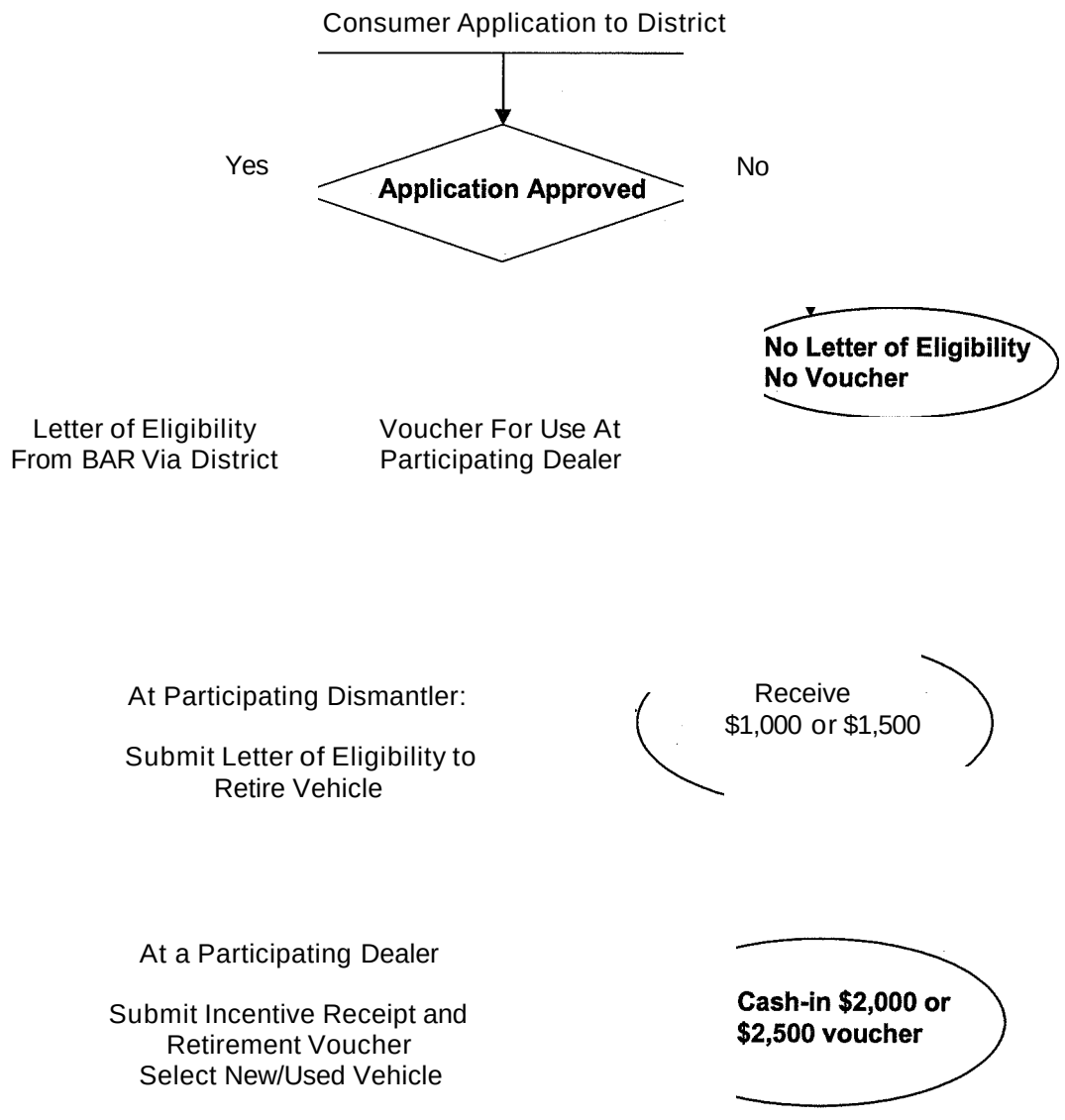
Staff proposes that BAR contract with dismantlers for the retirement portion of the EFMP program, as well as contract with the South Coast AQMD and San Joaquin APCD to administer the pilot voucher program. Under the proposal, the districts would oversee and work with participating dealerships for redemption of the vouchers. The districts would also effectively function as a field office of the BAR under an expanded CAP program for retirement of the vehicles receiving a voucher. The districts would also be directly responsible for administering and tracking vouchers and ensuring that funds are available. Dealerships would receive the vouchers from the consumer and submit the voucher, retirement receipt, and other paperwork to the districts for reimbursement.

Consumer Process

The process for a consumer to retire their vehicle under the proposed program would be consistent with the current CAP process. Consumers apply and receive approval from BAR via the mail. Once approved, the consumer takes the approval letter and vehicle to a dismantler under contract with BAR for retirement and compensation.

The consumer process for the pilot voucher program is shown in Figure 1. As illustrated, targeted consumers would apply to the districts for program approval. Targeted consumers could apply in person, via mail or at participating district events. The South Coast AQMD and San Joaquin Valley APCD would work behind the scenes with the Bureau of Automotive Repair (BAR) to determine vehicle eligibility and low-income status. Once approved by BAR for retirement and district staff for the voucher, the districts would then deliver to the consumer both a Letter of Eligibility supplied by BAR and a voucher supplied by the district. The consumer would take the Letter of Eligibility and the vehicle to a participating dismantler that would issue the retirement incentive as currently done under CAP. The voucher from the district and the retirement receipt from the dismantler could then be presented by the consumer for redemption at a participating new or used dealership within the air basin. The proposal is designed to be as consumer friendly as possible while ensuring that the appropriate controls are in place to prevent program abuse and fraud.

Figure 1: Voucher Process



Proposed EFMP B·udget

AB118 provides roughly $30 million annually to fund the EFMP. Table 3 provides an expected ongoing budget for the program. Given the uncertainty in program participation, ARB staff will monitor the program closely to determine if changes are needed, including an expansion of the voucher component. The available funding in the first year is $16.4 million, of which $3 million is dedicated to vouchers. This funding is sufficient to retire about 9,500 vehicles and provide 1,300 vouchers. The funding for each district is based on the ratio in the SIP resulting in $2.5 million for South Coast AQMDand $500,000 for San Joaquin Valley APCD.

Table 3: EFMP Budget

Agency	Allocations (in millions)	Vehicles Retired	Vouchers
BAR	$22	15,000	NA
Local Air Districts	$8	NA	3,500
Total	$30	15,000	3,500

Environmental and Economic Impacts

Vehicle retirement programs reduce fleet emissions by accelerating both the turnover of the existing fleet and the consequent replacement with newer, cleaner vehicles. Reducing emissions from the existing fleet is a critical part of California's SIP. The proposed program is strictly voluntary and does not require mandatory participation by businesses. For those choosing to participate, the regulation is expected to have modest positive impacts. The proposal's environmental and economic benefits are discussed in this section.

Emission Benefits

The proposed EFMP is expected to result in the accelerated retirement of up to 15,000 vehicles annually statewide, with almost 9,500 planned for the first full fiscal year. In addition, it is anticipated that the voucher program will provide incentives for about 3,500 participants, with about 1,300 planned for the first full fiscal year in the South Coast and San Joaquin Valley air basins. A detailed analysis of the estimated emission benefits is provided in Appendix C.

Emission benefits were estimated by taking the emissions difference between the retired vehicle and the replacement vehicle as calculated using EMFAC (the state's

mobile source emission inventory model). The EMFAC model output of the total daily emissions for the model year(s) of interest was divided by the total number of vehicles of that model year in order to arrive at the estimated daily emissions for a vehicle of that model year. The difference in estimated daily emissions between the vehicles of each model year is then multiplied by the expected life of the benefit; Le. the expected remaining life of the retired vehicle. This difference is the estimated benefit per vehicle participating in the program.

The emission benefits for the program are shown in Table 4. As shown in the Table, the majority of the program's benefits will be derived from the retirement of older vehicles and replacement with fleet average vehicles. While the emission benefits are greater on a per vehicle basis for vehicles receiving a voucher (emissions from the replacement vehicle are assumed to be the 2006 fleet average), there are far fewer vehicles in the voucher program. The overall program is expected to reduce smog-forming emissions by 1.6 tons per day. Emission benefits for the first full fiscal year, including the pilot voucher program, are estimated at about 1.0 ton per day NO_x +HC. In addition, it is expected that there will be both particulate matter (PM) and green house gas emission reductions as newer vehicles tend to emit less PM and tend to have better fuel economy.

Table 4: Estimated Emission Benefits

	Vehicles	Tons NO_x and HC (tons per day)
Vehicle Retirement	11,500	1.3
Vehicle Retirement and Replacement	3,500	0.3
	15,000	1.6

Economic Impacts

Vehicle retirement programs are voluntary for air districts, businesses, and vehicle owners, and a positive economical impact is created. Vehicle owners and businesses will not participate in VAVR programs if it is not economically beneficial. Potentially, a small number of new jobs may be created due to this increase. The doubling in retirement vehicles to the State's existing program may result in a modest increase in new jobs for dismantlers. As for dealerships, given the recent steep decline in the auto sales industry, the EFMP may help to maintain current employment levels as opposed to creating new jobs.

Owners of older, more polluting vehicles will benefit in that an expanded market will be created for their vehicles. An eligible vehicle with a useful life that may have had little resale value would have a cash value as a result of the vehicle's retirement. In turn, newer vehicles will be purchased in part by the incentive received from retiring a

vehicle. Individuals and businesses selling the newer vehicles may benefit slightly by an expanded market for their vehicles.

Environmental Justice

The proposal contains increased incentives and flexibility for income eligible participants. Consumers whose incomes do not exceed federal poverty gUidelines as currently defined under CAp[11], would be eligible for additional incentives upon proof of income status. Income eligible participants taking advantage of the clean vehicle voucher would also receive a higher voucher amount and be able to choose from a wider pool of replacement vehicles.

Cost-Effectiveness

Cost-effectiveness is a metric used to ensure that state funds are well spent and achieve the maximum air quality benefit. As an example, the Carl Moyer Program Incentives Program limits projects to those not exceeding a cost-effectiveness of $16,000 per weighted ton of hydrocarbon, oxides of nitrogen and particulate matter reduced. AS 118 directs that cost-effectiveness be considered but does not specify a cost-effectiveness limit. The cost effectiveness presented in this staff report does not include particulate matter in the calculations. Inclusion of particulate matter emissions in the cost-effectiveness estimations would tend to increase the cost-effectiveness of the program. The full analysis of the program's cost-effectiveness is presented in Appendix D.

Table 5 provides a summary of the cost-effectiveness for the program. Cost-effectiveness will vary significantly and depend on the age of the retired vehicle, whether a voucher is used, and in cases where additional incentives are provided for low-income participants. The cost-effectiveness for vouchers and income-eligible participants is higher than the Moyer limit but is consistent with the direction contained in the legislation that consideration be given to encourage cleaner vehicle replacements and low-income participation. Overall, the average cost-effectiveness of the program is estimated to be $16,000 per ton. Appendix D provides a detailed explanation of the methodology and assumptions of these estimates.

11 Refer to Appendix E for the maximum household income for income eligible participants.

Table 5: Estimated Cost Effectiveness

Consumer	Retirement	Voucher	Total	Dollar per ton (NO_X + HC)
General	$1,000	No	$1,000	$13,000
	$1,000	$2,000	$3,000	
Income-Eligible	$1,500	No	$1,500	$18,000
	$1,500	$2,500	$4,000	
All Participants				$16,000 [1]

1 Based on historical data from BAR's CAP program, a 56% income eligible/44% non-income eligible split is used to calculate the overall cost effectiveness.

Summary and Staff Recommendation

Voluntary accelerated vehicle retirement or "car scrap" programs provide monetary incentives to vehicle owners to retire older, more polluting vehicles. The purpose of these programs is to reduce fleet emissions by accelerating the turnover of the existing fleet and consequent replacement with newer, cleaner vehicles. Reducing . emissions from the existing fleet is a critical part of California's State Implementation Plan, which outlines the state's overall clean air strategy.

The proposal will almost double the State's existing vehicle retirement programs by providing approximately $30 million annually through 2015 to specifically target the higher polluting vehicles in the areas with the greatest air quality problems. The proposal introduces a new pilot voucher program that provides greater compensation for newer vehicle purchases in the South Coast and San Joaquin Valley air basins and includes additional incentives and flexibility for low-income populations.

The ARB staff recommends that the Board adopt the regulations as proposed in this Initial Statement of Reasons. Staff also proposes that a full review of the program occur by the end of 201 0 to determine program effectiveness and to recommend any necessary changes.

References

1. Air Resources Board's Proposed Strategy for California's 2007 State Implementation Plans, pages 100-101, April 26, 2007

2. Air Resources Board, The Carl Moyer Program Guidelines: Approved Revision 2008, Chapter XI, April 22, 2008.

3. Air Resources Board, Vehicle Retirement Program Comparisons (VAVR) Table, May 2008.

4. Air Resources Board, Report to the California Legislature: Status Report on the Development of Guidelines for the Enhanced Fleet Modernization Program (AB 118, Article 11), February 2009

5. Air Resources Board's Emissions Inventory, http://www.arb.ca.gov/

6. Emissions Tables, EMFAC2007. v2.3, Updated November 2006

7. Bureau of Automotive Repair, Consumer Assistance Program Application, 2008.

8. R. L. Polk & Co., Medium Age of Vehicles, PRNewswire, March 3, 2009

Appendix A: Proposed Regulatory Order

PROPOSED REGULATION ORDER

Regulation for AS 118 Enhanced Fleet Modernization Program

Adopt new sections 2620, 2621,2622,2623,2624,2625,2626,2627,2628,2629, and 2630 title 13, chapter 8.1, California Code of Regulations (CCR) to read as follows:

(Note: The entire text of sections 2620 through 2630 is new language.)

Chapter 8.1. AS 118 Enhanced Fleet Modernization Program

§ 2620. Purpose

The purpose of this regulation is to improve California air quality through the voluntary early retirement of vehicles as directed by the California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Assembly Bill 118 Statutes of 2007, Chapter 750; Health and Safety Code sections 44125-44126) section 44125(a). Vehicle owners, who meet certain eligibility requirements, are offered the following:

(a) Payment forthe voluntary retirement from operation of a motor vehicle and/or;

(b) Additional payment, in the form of a voucher, to owners of targeted vehicles for the purchase of a cleaner vehicle meeting emission and/or model year requirements, if they voluntarily retire a targeted vehicle.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code. Reference cited: 39600, 39601, and 44125, Health and Safety Code.

§ 2621. Definitions

(a) *"ARB or Board"* means the California Air Resources Board.

(b) *"BAR or Bureau"* means the Bureau of Automotive Repair in the Department of Consumer Affairs.

(c) *"Dismantle"* means to, crush, stamp, shred, or otherwise render permanently and irreversibly incapable of functioning as originally intended, any vehicle or vehicle part.

(d) *"Dismantler"* means the person or business, defined and licensed 'according to the requirements of California Vehicle Code sections 220, 221, 11500, et seq., and other business codes and the regulations of the Department of Motor Vehicles (DMV),

who under contract with BAR dismantles or otherwise removes from service those vehicles obtained in the Enhanced Fleet Modernization Program.

(e) *"District"* means a local air quality management district or air pollution control district, as defined by California Health and Safety Code, Part 3, Section 40000 et seq., which has responsibility for administering air pollution control programs.

(f) *"Drive Train Parts"* means all parts associated with the drive train such as engine, drive mechanism, transmission, differential, axles,and brakes.

(g) *"EFMP" means* the Enhanced Fleet Modernization Program.

(h) *IIEmissions-Related Part"* means any vehicle part which affects any regulated emissions from a vehicle that is subject to California or federal emissions standards and includes, but is not limited to, those parts specified in the "Emissions-Related Parts List," adopted by the State Board on November 4, 1977, as last amended June 1,1990.

(i) *"Income Eligible"* means eligible for increased financial incentives according to the income eligible definition used in the BAR Consumer Assistance Program (CAP).

(j) *"Solicited Vehicle"* means a vehicle identified by the Bureau and the Board and solicited by the Bureau for particlpation in the EFMP retirement program. These vehicles are identified by probability of being a high polluting vehicle. Solicited vehicles include: all pre-1976 model year vehicles; diesel vehicles; and additional vehicles identified by analysis of the data generated by the Smog Check programs.

(k) *"Targeted Vehicle"* means a vehicle identified by the Bureau, the Board, or the district to be eligible for a voucher and retirement under the EFMP. These vehicles are identified by probability of being a high polluting vehicle. Targeted vehicles include: all pre-1976 model year vehicles; diesel vehicles; and additional vehicles identified by analysis of the data generated by the Smog Check programs or vehicles identified by other means such as remote sensing. Targeted vehicles identified by analysis of emissions data will have a higher probability of high emissions than solicited vehicles; targeted vehicles are a subset of solicited vehicles.

(l) "Voucher" means a document with a specified redemption value issued by the district, and redeemed at a vehicle dealer for the replacement of a retired vehicle with a cleaner vehicle.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code.
Reference cited: 39600,39601, and 44125, Health and Safety Code.

§ 2622. Program Administration

(a) The Enhanced Fleet Modernization Program shall be administered by the Bureau through contracts with dismantlers, districts and other appropriate entities as necessary.

(b) The Bureau may contract annually with local air pollution control districts to administer the voucher portion of the EFMP. Districts may use up to five (5) percent of program funds to recover administrative costs incurred.

(c) The Bureau shall coordinate annually with the Board to determine the appropriate budget for the voucher program, given past performance.

NOTE: Authority cited: 39600,39601, and 44125, Health and Safety Code. Reference cited: 39600,39601, and 44125, Health and Safety Code.

§ 2623. Program Limits

An applicant determined to be eligible under the Enhanced Fleet Modernization Program may receive the following assistance:

(a) Payment up to one thousand dollars ($1,000) for each vehicle retired from operation at a dismantler operating under contract with the Bureau of Automotive Repair; or

(b) For income eligible participants, payment up to fifteen hundred dollars ($1,500) for each vehicle retired from operation at a dismantler operating under contract with BAR.

(c) Once thedismantler has purchased the vehicle, the consumer's eligibility status or the amount paid to the consumer cannot change.

Targeted Vehicles may also qualify for:

(d) Payment, in the form of a voucher, up to two thousand dollars ($2,000) toward the purchase of a replacement vehicle four years old or newer; or

(e) For income eligible participants, payment, in the form of a voucher, up to twenty-five hundred dollars ($2,500) toward the purchase of a replacement vehicle eight years old or newer.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code. Reference cited: 39600,39601, and 44125, Health and Safety Code.

§ 2624. Eligibility Requirements

(a) In order to apply for participation in the EFMP, an individual must submit a completed application as specified at Section 3394.6 of Title 16 of Division 33, Article 11 of the California Code of Regulations, to BAR with original signature(s).

(b) In order to participate in the EFMP, a vehicle must meet the following requirements, as applicable:

(1) It shall be voluntarily sold to a Dismantler under contract with the BAR;

(2) It shall be currently registered with the DMV as an operable vehicle and shall have been so registered continuously for at least 24 months prior to the date of application to an address or addresses within the state., or

(A) A yehicle may also be eligible if the owner of the vehicle placed the vehicle in planned non-operational status per Vehicle Code Section 4604, et seq., for a total of sixty (60) or fewer days during the continuous twenty-four (24) months registration period and occurring at least ninety (90) days prior to the date of application, or

(B) A vehicle may also be eligible if the registration has lapsed for less than 121 days during the previous twenty-four (24) months, pursuant to Health and Safety Code 44094, and all appropriate registration fees and late penalties have been paid to the DMV, provided that the vehicle is registered for at least ninefy (90) days immediately prior to the date of application;

(C) Determination of an individual vehicle's registration history shall be based on:

1. Registration data for that vehicle obtained from DMV records ;and

2. If C.1 provides inconclusive results for an individual vehicle, then copies of the applicable vehicle registration certificates may be used;

(D) An unregistered vehicle may also be eligible if proven to have been driven primarily in California for the last two years and not have been registered in any other state or country in the last two years. Documentation of operation in California includes the following.

1. Proof of insurance for the last two years; or

2. Invoice(s) (showing the vehicle identification number) for vehicle repairs and/or maintenance during the previous two years and proof of owner's residence in the state during the same period.

(3) It shall be a vehicle with up to 10,000 pounds gross vehicular weight rating: including a passenger vehicle, truck, sports utility vehicle (SUV), or van;

(4) It may be operating under a Smog Check repair cost waiver or economic hardship extension issued pursuant to Health and Safety Code Section 44017 or 44017.1;

(5) It may be currently operating under a Temporary Operating Permit issued by the Department of Motor Vehicles.

(6) Vehicles that are tampered, pursuant to Section 3340.41.5 of Title 16, Division 33, Article 5.5 of the California Code of Regulations, shall be eligible for acceptance into the EFMP program.

(c) Each vehicle Shall pass the visual and operational inspection required by the Consumer Assistance Program, performed by the dismantler or BAR representative, and conducted on-site at the dismantler location. The inspection requirements for the Consumer Assistance Program are defined in CCR Sections 3394.4 (c) (8) and 3394.4 (c) (9). Vehicles failing the requirements pursuant to Section 2624 may be re-inspected by the Dismantler for compliance with these requirements at any time after modifications have been made to the vehicle to correct the deficiencie(s).

(d) An applicant shall not have retired another vehicle through the EFMP or the BAR Consumer Assistance Program within the preceding twelve (12) month period: and a vehicle owner who is a joint owner of a vehicle shall not have retired more than two (2) vehicles through the EFMP or BAR Consumer Assistance Program within a twelve (12) month period.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code. Reference cited: 39600,39601, and 44125, Health and Safety Code.

§ 2625. Ineligible Vehicles

(a) A dismantled vehicle pursuant to Section 11519 of the Vehicle Code.

(b) A vehicle registered to a non-profit organization or a business.

(c) A Vehicle operated by a fleet licensed and registered pursuant to Section 44020 of the Health and Safety Code.

(d) A vehicle being initially registered in California.

(e) A vehicle undergoing a transfer of ownership.

§ 2626. Targeted Vehicles and Vehicle Solicitation

(a) BAR will identify vehicles with the greatest potential for having the highest emissions for participation in the EFMP. BAR shall use existing vehicle emissions data to identify and .solicit program participation beginning with vehicles with the highest emissions potential first. Solicited vehicles include: all pre-1976 model year vehicles; diesel vehicles; and additional vehicles identified by analysis of the data generated by the Smog Check programs.

(b) BAR will adjust solicitation based on consumer participation.

(c) BAR shall primarily focus solicitation efforts in the South Coast and San Joaquin Valley basins.

: (d) Districts may solicit Targeted Vehicles as appropriate for participation in the voucher portion of the EFMP. Targeted vehicles shall be those with the greatest. potential for having the highest emissions. Targeted vehicles shall be pre-1976 vehicles, diesel vehicles, or other vehicles as identified using the BAR High Emitter Profile model, or by other means as approved by the Board.

§ 2627. Vouchers

(a) Vouchers will initially be offered in the South Coast and San·Joaquin Valley air basins with inclusion of other air districts as determined by the Board. The Bureau shall consult with the Board annually regarding the status and expansion of the voucher program.

(b) BAR shall contract with the district to administer the voucher program.

(c) The district administrating the voucher program shall submit applications for EFMP retirement to BAR for approval and determination of income eligibility. If approved, BAR shall issue a Letter of Eligibility (LOE), which the district will give to the applicant.

(d) The district administrating the voucher program shall contract with participating vehicle dealers for redemption of the vouchers.

(1) All entities under contract to redeem vouchers must be licensed as dealers; private-party vehicle transactions are not eligible for voucher redemption.

(2) The voucher may not be redeemed on the purchase of a dismantled vehicle (pursuantto Section 11519 of the Vehicle Code).

(3) The voucher may not be redeemed on the purchase of a vehicle with a salvaged title.

(e) No person may receive more than one voucher from the EFMP program.

(f) Vehicles shall not be eligible for a voucher unless they meet the registration requirements of Section 2624 at an address in the district where the voucher is issued.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code. Reference cited: 39600,39601, and 44125, Health and Safety Code.

§ 2628. Parts Recycling and Resale.

Dismantlers, and their agents, contractors and employees shall not remove any parts from an EFMP purchased vehicle for resale or reuse unless specifically exempted by BAR through contract.

(a) No compensation with public funds from the EFMP shall be granted for any vehicle from which emission-related or drive train parts have been sold.

(b) All activities associated with retiring vehicles, including but not limited to the disposal of vehicle fluids and vehicle components, shall comply with:

(1) Local water conservation regulations;

(2) State, county, and city energy and hazardous materials response regulations; and

(3) Local water agency soil, surface, and ground water contamination regulations.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code. Reference cited: 39600,39601, and 44125, Health and Safety Code.

§ 2629. Records and Auditing

(a) Records shall be securely maintained by the dismantler for each vehicle purchase and transaction in the EFMP program.

(b) Records shall be maintained by the district for each voucher redemption and transaction in the EFMP program.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code. Reference cited: 39600,39601, and 44125, Health and Safety Code.

§ 2630. Severability

Each part of this article shall be deemed severable, and in the event that any provision of this article is held to be invalid, the remainder of this article shall continue in full force and effect.

NOTE: Authority cited: 39600, 39601, and 44125, Health and Safety Code.
Reference cited: 39600,39601, and 44125, Health and Safety Code.

Appendix B: Assembly Bill 118 (Nunez, Chapter 750, Statutes of 2007)

SEC. 4. Article 11 (commencing with Section 44125) is added to Chapter 5 of Part 5 of Division 26 of the Health and Safety Code, to read:

Article 11.Enhanced Fleet Modernization Program

44125. (a) No later than July 1,2009, the state board, in consultation with the Bureau of Automotive Repair (BAR), shall adopt a program to commence on January 1, 2010, that allows for the voluntarily retirement of passenger vehicles and light-duty and medium-duty trucks that are high polluters. The program shall be administered by the BAR pursuant to guidelines adopted by the state board.
(b) The guidelines shall ensure all of the following:
(1) Vehicles retired pursuant to the program are permanently removed from operation and retired at a dismantler under contract with the BAR.
(2) Districts retain their authority to administer vehicle retirement programs otherwise authorized under law.
(3) The program is available for high polluting passenger vehicles and light-duty and medium-duty trucks that have been continuously registered in California for two years prior to acceptance into the program or otherwise proven to have been driven primarily in California for the last two years and have not been registered in any other state or country in the last two years.
(4) The program is focused where the greatest air quality impact can be identified.
(5) Compensation levels for retired vehicles are flexible, taking into account factors including, but not limited to, the age of the vehicle, the emission benefits of the vehicle's retirement, the emissions impact of any replacement vehicle, and the location of vehicles in areas of the state with the poorest air quality.
(6) Cost-effectiveness and impacts on disadvantaged and low-income populations are considered. .

44126. The Enhanced Fleet Modernization Subaccount is hereby created in the High Polluter Removal and Repair Account. All moneys deposited in the subaccount shall be available to the department and the BAR, upon appropriation by the Legislature, to establish and implement the program created pursuant to this article.

Appendix C: Estimated Emissions Benefits of EFMP

Emission benefits for the EFMP are estimated by taking the difference between the retired vehicle and the replacement vehicle as calculated using EMFAC (the state's mobile source emission inventory model). EMFAC output of the total daily emissions for the model year(s) of interest is divided by the total number of vehicles of that model year in order to arrive at the estimated daily emissions for a vehicle of that model year. The difference in estimated daily emissions between the vehicles of each model year is then multiplied by the expected life of the benefit; Le. the expected remaining life of the retired vehicle.

This difference is the estimated benefit per vehicle participating in the program. Note that the estimate will vary based on the assumptions used for both the retired vehicle and the replacement vehicle. Several estimates based on a variety of assumptions about the retired vehicle and replacement vehicle are presented below. These estimates provide an expected range for the emissions benefit. Total program benefits are then estimated by multiplying the estimated per vehicle benefit by the estimated number of vehicles participating in the program.

Estimated Emissions Benefit Per Retired Vehicle in 2010

Retired Vehicle [3,7]	Replacement Vehicle [3,7]	Scenario Description	Tons [1,2,4] ROG + NO_x
	Retirement *WITHOUT* Voucher		
1985-1988 MY [5]	2001 MY [6]	Typical retirement	.11
Pre-1976 MY	2001 MY [6]	Older car retirement	.33
Diesel (LOA all MY	2001 MY [6]	Diesel retirement	.03
1985-1988 MY [5]	2010 MY	New vehicle re lacement	.13
	Retirement *WITH* Voucher		
1985-1988 MY [5]	2006 MY [8]	Typical voucher (replacement 4 yrs old or newer	.13
1985-1988 MY [5]	2002 My [8]	Typical Income eligible *wi* voucher (replacement 8yrs old or newer	.11

Notes:

1) EMFAC2007 v2.3 (Nov 1 2006), Summer Planning Inventory, Statewide.
2) The estimated benefit is calculated for the planned commencement of the EFMP in calendar year 2010.
3) The emissions of retired vehicles from model years 1976 to present are assumed 30% higher than the average of the model year of the retired vehicle. This assumption reflects the planned efforts to solicit HEP vehicles. The emissions of the replacement vehicle are the average of the model year of the replacement.
4) The useful remaining life of the retired vehicle is three years. The daily estimate produced by EMFAC is multiplied by 365 days per year and then multiplied by the assumed three year life.
5) The model year of the retired vehicle is assumed to be 1985-1988. This assumption is based on the center of the model year distribution of vehicles retired under the state's existing vehicle retirement program, CAP (Consumer Assistance Program) run by the state Bureau of Automotive Repair.
6) The model year of the replacement vehicle is nine years old, or 2001. This is approximately the mean age of the entire fleet in 2010.
7) All vehicles up to 8500 lbs GVWR are included for a given model year. This implies that the distribution of vehicle types and vehicle GVWR for the retired vehicles is the same as the ratio in the model.
8) Assumes the oldest (highest emitting) model year replacement acceptable to the voucher program.

Example Calculation:

Scenario: Retired vehicle is 1985-1988 model year and the replacement vehicle is 2001 model year.

For the retired vehicle, EMFAC outputs the following daily emissions estimate:

Vehicle Class	LDA	LDT1	LDT2	MDV	TOTAL
Class Population	420,479	143,516	147,955		763,714
ROG Emissions (tons per day)	21.29	7.39	8.82		40.55
NOx Emissions (tons per day)	13.05	8.08	8.75		33.16
Total ROG + NOx (tons per day)	34.34	15.47	17.57		73.71

Calculations:					
ROG + NOx (tons per vehicle per year)	0.0298	0.0393	0.0433	0.0446	0.0352
ROG + NOx (tons per vehicle for 3 years)	0.0894	0.1180	0.1300	0.1339	**0.1057**

For the replacement vehicle, EMFAC outputs the following daily emissions estimate:

Vehicle Class	LDA	LDT1	LDT2	MDV	TOTAL
Class Population	764,293	269,455	288,972	161,880	1,484,600
ROG Emissions (tons per day)	5.19	1.91	2.45	1.97	11.52
NOx Emissions (tons per day)	6.85	3.69	5.68	4.1	20.32
Total ROG + NOx (tons per day)	12.04	5.6	8.13	6.07	31.84

Calculations:					
ROG + NOx (tons per vehicle per year)	0.0057	0.0076	0.0103	0.0137	0.0078
ROG + NOx (tons per vehicle for 3 years)	0.0172	0.0228	0.0308	0.0411	**0.0235**

The emissions benefit is therefore calculated as .1057 tons -.0235 tons.=.0822 tons

Using an assumed 30% higher than average emissions from the retired vehicle due to solicitation efforts for high emission vehicles....1.3*(.1057)-.0235=.1139 tons

Actual EMFAC output is shown at the end of this appendix. All of the other emission benefits shown in the table above are calculated similarly.

Discussion of Assumptions and Estimates

Selection of the 1985-1988 model years as a typical retired vehicle is a conservative assumption that results in the calculation of a lower benefit. The 1985-1988 model years were selected to represent the typical retired vehicle because they are the center of the distribution of model years that are actually scrapped under the Bureau of Automotive Repair's Consumer Assistance Program (CAP). However, that program specifically excludes pre-1976 vehicles. Inclusion of the omitted pre-1976 models would tend to increase the estimate because they are generally the highest emitting vehicles in the fleet. It may also be expected that the fractional population of pre-1976 vehicles in the population of retired vehicles is higher than their fractional population in the total fleet as the incentive offered for retirement may appear as a bettervalue to consumers selling older vehicles.

Selection of a nine year old vehicle as the replacement may under or over estimate the emissions of the replacement vehicle depending on assumptions about the replacement vehicle. The mean age of vehicles in the fleet is about nine years old, thus it is a logical choice for replacement vehicle. However, the emissions of the nine year old vehicle are estimated by EMFAC to be about 32% less than the mean emissions of the entire fleet.

It is also likely that the replacement vehicle for emissions calculations purposes is theoretically not a vehicle of mean age (nine years old), nor a vehicle of mean fleet emissions, but a brand new vehicle; if the owner of the retired vehicle buys a used vehicle as a replacement, then the seller of that used vehicle will presumably replace

the vehicle with another, and so on, until ultimately someone purchases a new vehicle. It is not typical for the replacement vehicle to appear from nowhere with no effect on the existing fleet; the replacement is either taken from someone else in the fleet who replaces their vehicle, or in rare situations it may come from out of state. A simple difference in emissions of the vehicle actually retired and the actual replacement vehicle is only an estimate of that *individual driver's* emissions benefit and not an accurate estimate of the effect of the retirement action on the emissions of the fleet. The effect of the retirement on the entire fleet must take into account the replacement for the replacement vehicle and so on. In order to present a conservative emission benefit, this analysis does not include the assumption that every replacement is a new vehicle.

Estimated Total Emissions Benefit for the EFMP

The total emissions benefit of the EFMP program is calculated by multiplying the per vehicle benefit by the number of participating vehicles. Given that the available funds are fixed and the amount offered per vehicle is pre-determined, there is perhaps less uncertainty in the number of participating vehicles. The total emissions benefit for a number of different scenarios is presented below. Staff's expectation for the maximum potential funding of the program is retirement of up to 15,000 vehicles with vouchers issued for up to 3,500 of those vehicles; the estimates of total program benefits shown below use this assumption. Note that the total number of tons shown below is calculated by multiplying the total per vehicle benefit calculated earlier in this appendix by 15,000 retired vehicles. The tons per day estimate is the total benefit in tons divided by 365 days per year and then divided by three (benefit is assumed to be over a three year period as discussed earlier).

Estimated Total **Emissions Benefit for EFMp**[1]

Retired Vehicle	**Replacement Vehicle**	**Scenario Description**	**Total Tons ROG + NO_x**	**tons** per day **ROG + NO_x**
1985-1988 MY	2001 MY	Typical retirement	1,750	1.6
All Pre-1990	2001 MY	Capture of some older vehicles	2,550	2.3
All Pre-1976 MY	2001 MY	Older vehicle retirement	5,100	4.7

1Preliminary budget proposals from BAR reflecting current economic conditions for FY *2010/2011* fund this program at about 50% of the level used to construct the table above. Therefore, the estimated emission benefit for FY *2010/2011* is about 50% of the values shown above.

Appendix D: Calculation of Cost Effectiveness of EFMP

The cost effectiveness of the EFMP will vary based on the types of vehicles retired, the number of vouchers granted, and the actual funds appropriated. An estimate for the total program is shown below.

Estimated Cost Effectiveness of EFMP program:

	Income Eligible	General (Non-Income Eligible)	Total [1] EFMP
Retirement Cost (# vehicles x $ incentive	8,500 x $1,500 = $12,750,000	6,500 x $1,000 = $6,500,000	$19,250,000
Voucher Cost	1,900 x $2500 = $4,750,000	1,600 x $2000 = $3,200,000	$7,950,000
Administration	$1,575,000	$1,225,000	$2,800,000
Total Cost	$19,075,000	$10,925,000	$30,000,000
Emissions Benefit (# vehicles x tons benefit	8,500 x .1139 = 970 tons	6,500 x .1139 = 740 tons	1,710 tons
Cost Effectiveness [2]	$18,100/ton	$13,100/ton	**$15,900/ton**

Notes:

1) Assumes the following:
   a) Total funding of approximately $30 million; approximately $8 million for vouchers.
   b) Approximately 57/43 split of income eligible/non-income eligible incentives (ratio taken from existing CAP retirement program).
   c) Emissions benefits from EMFAC as described in appendix of estimated emission benefits.
   d) Retired vehicle is 1985-1988 model year.
   e) Replacement is mean age vehicle (nine years old)
   f) 30% increase in retired vehicle emissions (from EMFAC) to account for planned efforts to solicit high emitters.
2) Consistent with other incentive programs, administration costs are not included in cost effectiveness calculations.

Appendix E: Income Eligibility Table

Number of People in Household	Maximum Annual Gross Household Income
1	$23,400
2	$31,500
3	$36,600
4	$47,700
5	$55,800
6	$63,900
7	$72,000
8	$80,000
More than 8, for each add:	$8;100

Reference: Smog Check Consumer Assistance Program Application, Bureau of Automotive Repair, Feb 2008

CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC MEETING TO CONSIDER AN UPDATE ON OUTREACH AND FUNDING ASSISTANCE FOR TRUCK OWNERS

The Air Resources Board (ARB or Board) will conduct a public meeting at the time and place noted below to consider an informational update on outreach and funding assistance for truck owners impacted by ARB regulations.

DATE: June 25, 2009

TIME: 9:00 a.m.

PLACE: California Environmental Protection Agency
Air Resources Board
Byron Sher Auditorium
1001 I Street
Sacramento, California 95814

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., June 25, and may continue at 8:30 a.m., on June 26. This item may not be considered until June 26. Please consult the agenda for the meeting, which will be available at least 10 days before June 25, to determine the day on which this item will be considered.

If you require special accommodations or language needs, please contact the Clerk of the Board at (916) 322-5594 or by facsimile at (916) 322-3928 as soon as possible, but no later than 10 business days before the scheduled board hearing. TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

ARB regulations require truck owners to upgrade their diesel vehicles to reduce emissions of toxic and criteria pollutants, as well as greenhouse gases. Funding assistance is available through several ARB and local agency programs to achieve emission reductions beyond those required by the rules, most commonly through early compliance. These funding assistance programs include the Proposition 1B: Goods Movement Emission Reduction Program, Carl Moyer Program and new Carl Moyer Voucher Incentive Program, AB 118: Air Quality Improvement Program and the Providing Loan Assistance for California Equipment Program.

ARB is committed to a streamlined and integrated approach to help truck owners quickly understand regulatory requirements and determine which funding assistance programs may help them. ARB staff will make an oral presentation describing this integrated outreach and the status of truck funding assistance.

Major elements of the integrated outreach approach include teleph.one and Internet resources, and expanding ARB's traditional means of outreach. Staff has developed a comprehensive telephone hotline, (866) 6DIESEL (866-634-3735), to assist fleet owners in understanding the rules and funding assistance for their specific equipment. The hotline offers personalized assistance in multiple languages. Further, ARB staff is

finalizing a centralized, easy-to-navigate website, which assembles relevant truck-related information geared toward different groups of stakeholders. ARB staff will also explore new and traditional ways to increase awareness of regulations and funding programs. As part of this process, staff has actively teamed with stakeholders, especially local agency partners, who occupy a unique and critical role in implementing air quality programs throughout the State. ARB staff will continue to develop this comprehensive approach, evaluating effectiveness and improving the program on an on-going basis.

Interested members of the public may also present comments orally or in writing at the meeting, and in writing or by email before the meeting. To be considered by the Board, written comments not physically submitted at the meeting must be received **no later than 12:00 noon, June** 24, **2009** and addressed to the following:

Postal majl: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.govllispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests, but does not require 30 copies of any written submission. Also, ARB requests that written and email statements be filed at least 10 days prior to the meeting so that ARB staff and Board members have time to fully consider each comment. Further inquiries regarding this matter should be directed to Ms. Jessica Dean, Air Resources Engineer, at (916) 322-8748, or Mr. John Kato, Manager of the Innovative Strategies Section, at (916) 322-2891.

CA IFORNIA AIR RESOURCES BOARD

Date: June 5, 2009

James N. Goldstene
Executive Officer

The energy challenge facing California is . Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov.